



OWNER'S AND OPERATOR'S MANUAL

Diesel Engine Generator & Welder

DGW400DMC

Vertical, Water-Cooled 4-Cycle Diesel Engine



CAUTION

Do not operate the Generator/Welder, or any other appliance, before you have read and understood the instructions for use and keep near for ready use.

DGW400DMC-400

X750-022 88 0

X750803-670 0

Introduction

We would like to thank you very much for purchasing this Shindaiwa Soundproof Diesel Engine Generator & Welder.

- This manual has been created in order to ensure safe and proper use of this equipment. Be sure to thoroughly read this manual before operating the equipment as the improper operation of this equipment can result in an accident or malfunction.
 - This equipment should only be operated by persons who thoroughly understand the contents of this manual and can safely operate the equipment. Persons who are ill, taking medicine, or are in bad health should not operate this equipment if such conditions will affect operation of the equipment and related work.
 - Operation and use of this equipment must be in strict compliance with the applicable laws, as well as rules and regulations based on such laws.
 - Always be sure to include this manual with the equipment if it is loaned out to another party, and instruct said party that they must thoroughly read this manual before operating the equipment.
 - Store this manual securely in a predetermined location so that it can be readily accessed at all times to order parts or arrange for repair. Contact the retail outlet where this equipment was purchased if any parts are lost, the equipment becomes soiled, or is otherwise damaged in any manner.
 - Consult with the retail outlet where the equipment was purchased if any of the points are unclear or you would like further information. Be sure to note the model name and serial number of your equipment, and provide this information when making an inquiry.
 - If disposing of this equipment, dispose in a manner according to laws and regulations applicable to industrial waste. Consult with the retail outlet where the equipment was purchased if you have any inquiries regarding proper disposal.
- The precautions used in this manual are divided into the following three ranks.

⚠ Warning : Improper operation can result in death or serious personal injury.

⚠ Caution : Improper operation can result in moderate or minor personal injury, or physical damage.

<Note> : Explanatory note in order to ensure that equipment protection and performance are fully realized.

- It is possible that items described under **< ⚠ Caution >** or **<Note>** can result in a serious accident depending on the circumstances. The contents of both of these types of precautions are important. Be sure to always comply with all precautions.

Table of Contents

1. Safety Precautions	2
2. Specifications	6
3. Applications	6
4. Part Names	7
5. Equipment	10
5-1. Spill Containment	10
5-2. VRD (Voltage Reduction Device)	10
5-3. Idle Control.....	11
5-4. Weld Mode Selector.....	12
5-5. Remote Control (Option)	12
5-6. Meter.....	13
5-7. Error Code Display.....	14
5-8. Monitor Lamp	14
5-9. Frequency Selector	15
5-10. Voltage Adjustment Dial	16
5-11. Earth Leakage Circuit Breaker and Grounding.....	16
6. Pre-Operation Inspection	18
6-1. Engine Oil Inspection	18
6-2. Cooling Water Inspection	19
6-3. Fuel Inspection.....	20
6-4. Spill Containment Inspection.....	20
6-5. Inspection for Fuel/Oil/Cooling Water Leakage	21
6-6. Battery Inspection	21
7. Operating Procedures	22
7-1. Starting the Engine.....	22
7-2. Stopping the Engine.....	23
8. Using as a Welder	24
8-1. Welding Cable Selection	24
8-2. Welding Polarity	24
8-3. Welding Cable Connection.....	25
8-4. Duty Cycle.....	25
8-5. Welding Work.....	26
9. Using as a Generator	27
9-1. Output Types and Ranges.....	27
9-2. Usable Device Capacities	28
9-3. Operation	28
10. Simultaneously Welding and Using as AC Power Source	30
11. Inspection/Maintenance	30
12. Long-Term Storage	37
13. Troubleshooting	38
14. Engine Wiring Diagram	41
15. Generator Wiring Diagram	42

1. Safety Precautions

⚠ Warning: Suffocation from Exhaust Fume

- Do not operate the equipment in a poorly-ventilated area such as indoors or within a tunnel because the engine exhaust fume includes components that are harmful to humans.

⚠ Warning: Suffocation from Welding Fume

- Always be sure to wear a fume-proof mask when welding as the fumes generated during welding include harmful gases and dust. Also be careful that the wind direction is not such that it will cause fumes to be inhaled and always operate the equipment in a well-ventilated area.

⚠ Warning: Electric Shock

- Do not operate the equipment with any doors or covers open.
- Do not touch wirings or any electric parts inside the equipment during operation.
- Do not touch the equipment during operation if the equipment or your body is wet.
- Be sure to stop the engine whenever touching Weld output terminals such as when installing or removing welding cables.
- Do not connect welding cables to any part other than Weld output terminals.
- Do not insert any metallic objects, such as pins or wires, into AC output receptacles or remote controller connectors.
- Always be sure to turn off all breakers before installing or removing devices using AC output receptacles.
- Always be sure to repair the corresponding earth leakage location when earth leakage circuit breakers operate.
- Always be sure to stop the engine and remove the starter key before performing any equipment check or maintenance.

⚠ Warning: Fire

- Always be sure to stop the engine when inspecting fuel or refueling, and absolutely never perform such tasks near fire or other open flame. Wait until the engine has completely cooled before inspecting fuel or refueling.
- Always be sure to wipe up any spilled fuel or oil.
- Spilled fuel and oil accumulates in the spill containment. Do not operate the equipment with liquid accumulated in the spill containment.
- Absolutely never use the equipment if there is a fuel, oil or cooling water leak, and be sure to always repair the leak before using.
- Absolutely never inspect or perform maintenance to the equipment near fire or other open flame.
- Keep any ignitable items (such as fuel, gas and paint) or inflammable items away from the equipment because the muffler, exhaust fume and other parts attain high temperatures.
- Keep any ignitable items (such as fuel, gas and paint) or inflammable items away from the work area due to the scattering of weld spatter that occurs during welding.
- Provide at least 1 meter (3 feet) of distance between the equipment and walls and other obstacles, and operate the equipment on a flat surface.

- Allow the equipment to cool before covering with protective covers and similar items.
- Do not ground wiring of earth leakage circuit breakers of the equipment to piping that passes through flammable material.

⚠ Warning: Injury

- Do not operate the equipment with any doors or covers open. There is a danger of hair, body parts and other items being caught up in moving parts such as cooling fans and belts.
- Do not modify the equipment and do not operate with parts removed.
- Always be sure to stop the engine and remove the starter key before performing any equipment check or maintenance.

⚠ Warning: Injury to Eyes and Skin

- Use protective gear, such as rubber gloves, when inspecting or replacing the battery due to the dilute sulfuric acid in the battery fluid. Be sure that fluid does not get into eyes, or on skin or clothing.
- If battery fluid gets into the eyes, or on the skin or clothing, immediately wash with a large amount of water, and always be especially sure to seek medical attention if it gets into the eyes.

⚠ Warning: Explosion

- Do not operate the equipment or recharge the battery when the battery fluid level is below the lower level.
- Do not generate any sparks near the battery and do not allow any fire or other open flame near the equipment because the battery generates ignitable gas.

⚠ Warning: Electromagnetic Interference

- Persons using a heart pacemaker are not allowed near the welder or welding work area while welding is being performed without the permission of a doctor. The welder generates a magnetic field while energized that can negatively affect pacemaker operation.

⚠ Caution: Suffocation from Exhaust Fume

- Do not direct the engine exhaust towards passersby, private homes or similar persons/locations because the engine exhaust fume includes components that are harmful to humans.

⚠ Caution: Electric Shock

- Do not sprinkle water on the equipment and do not use where exposed to rain.
- If wearing gloves, be sure to always wear gloves with dry insulation properties. Do not wear gloves that are damaged or wet.

⚠ Caution: Burn

- The engine, muffler and similar parts are extremely hot during operation and immediately after stopping the equipment. Never touch hot parts.
- Never open the radiator cap during operation or immediately after stopping the equipment. Hot cooling water and steam will spurt out.
- Always be sure to stop the engine and allow it to cool before inspecting or changing the engine oil. Opening the oil gauge or oil plug during operation will result in hot oil spurting out.

⚠ Caution: Injury

- Use this equipment with it situated on a stable level surface so that it is prevented from moving.
- Do not move the equipment during operation.
- Always be sure to turn off the switches of all devices using the equipment and turn off the equipment breakers before starting the engine.
- Always be sure to turn off the power switches of all devices using the equipment when turning on the equipment breakers. Leaving on the power switch of a device using the equipment when the equipment breakers are turned on could result in the sudden operation of the corresponding device.
- Do not leave on the power switch of a device using the equipment and do not connect a device to an AC output receptacle.
- The lifting lug is designed to be used only for lifting the equipment. Do not lift the equipment with any heavy items (such as a trailer, gas canister and additional fuel tank) added to the equipment.
- Always be sure to use the lifting lug when lifting the equipment, and lift slowly and directly straight above.
- Wear a helmet, safety shoes, gloves and similar protective gear when performing lifting work. Do not stand or get under the equipment while it is suspended.
- Securely fix the equipment with rope or similar item so that it cannot move when transporting by truck or other vehicle.

⚠ Caution: Injury to Eyes and Skin

- Always be sure to wear arc-proof glasses, clothes that completely cover the skin and other protective gear when welding to protect the eyes and skin from harmful light rays generated during welding.
- Always be sure to wear leather gloves, apron, shoe covers, arc-proof glasses (face shield), safety shoes, hard hat and long-sleeve clothing to protect against the scattering of weld spatter that occurs during welding.

⚠ Caution: Physical and Secondary Damage

- Do not use the equipment for any improper applications. Improper usage can result in an accident or malfunction.
- Do not connect the AC power source to indoor wiring.
- If using the equipment as a power source for medical equipment, you must check with the medical equipment manufacturer, doctor and hospital before using the equipment.
- Set the frequency in accordance with the devices using the equipment.

■ Location of Warning Labels

Replace warning labels when they become difficult to see or damaged by affixing new labels in the specified locations. Order the necessary labels by numbers in parentheses.

(1) Suffocation from Exhaust Fume (No. X505-007 59 0)

(2) Suffocation from Welding Fume (No. X505-007 60 0)

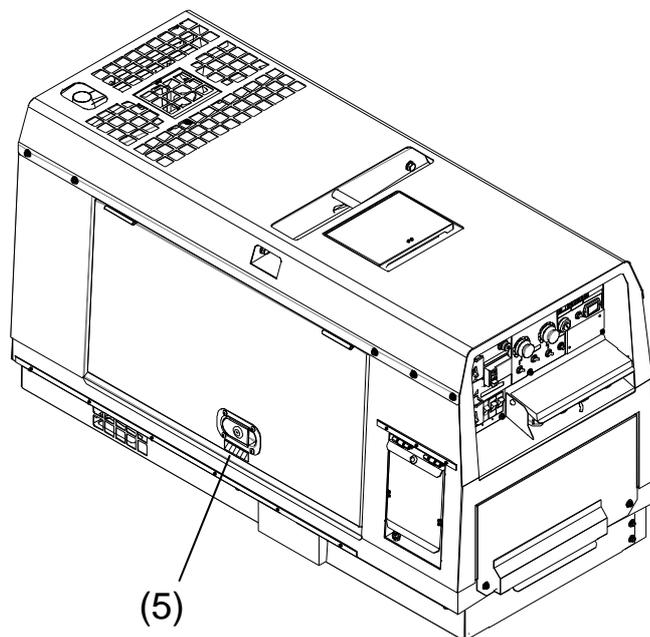
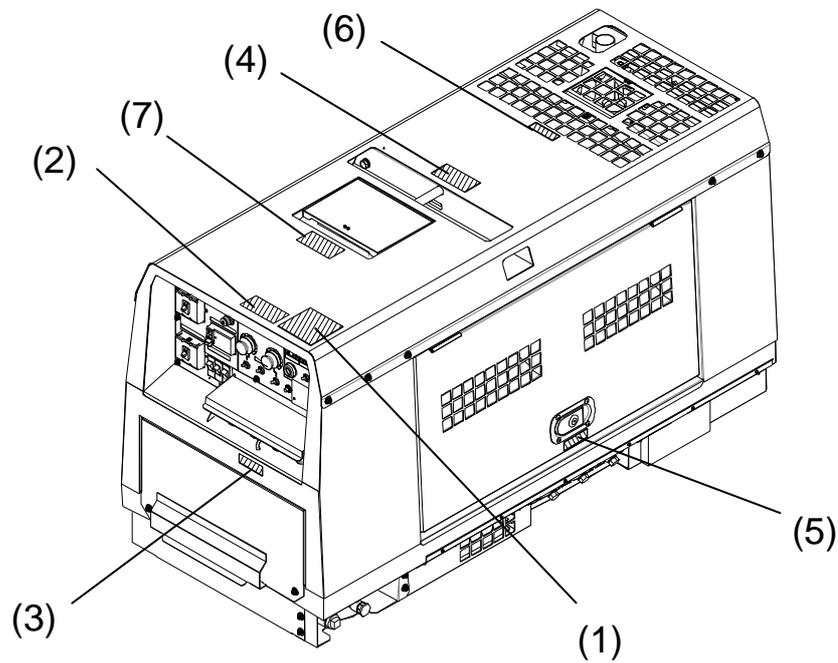
(3) Electric Shock (No. X505-007 61 0)

(4) Injury (No. X505-007 55 0)

(5) Injury (No. X505-007 63 0)

(6) Burn (No. X505-007 62 0)

(7) Fire (No. X505-007 65 0)



2. Specifications

Model		DGW400DMC-400	
Generating Method		Rotating Field	
Welding DC Generator	Operation	Single	Dual
	Rated Current (A)	370/390	180/200
	Rated Voltage (V)	34.8/35.6	27.2/28.0
	Duty Cycle (%)	60	100
	Current Adj. Range (A)	95-390/110-400	50-200/60-210
	Welding Rod (mm)	φ2.6-φ8.0	φ2.0-φ4.0
	Rated Speed (min ⁻¹)	3000/3600	
	No Load Voltage (V)	MAX 85	
AC Generator	Rated Frequency (Hz)	50/60	
	Rated Speed (min ⁻¹)	3000/3600	
	Phase	1-Phase	3-Phase
	Rated Voltage (V)	230/250	400/440
	Rated Current (A)	15Ax3	20
	Power Factor	1.0	0.8
	Rated Output (kVA)	9.6/11.3	12/15
	Rating	Continuous	
Engine	Model	Kubota D902	
	Type	Vertical, Water-Cooled 4-Cycle Diesel Engine	
	Displacement (L)	0.898	
	Rated Output (kW/min ⁻¹)	15.0/3000	17.6/3600
	Fuel	ASTM No.2-D Diesel Fuel or Equivalent	
	Lubricant Oil	API Class CD or Higher	
	Lubrication Oil Volume (L)	3.6 (Effective 1.7)	
	Cooling Water Volume (L)	4.0 (Sub Tank Capacity 0.6 L included)	
Starting Method	Starter Motor		
Battery	46B24L (Japanese Industrial Standard)		
Fuel Tank Capacity (L)	37		
Dimension	Length (mm)	1457	
	Width (mm)	635	
	Height (mm)	778	
Dry Weight (kg)	430		

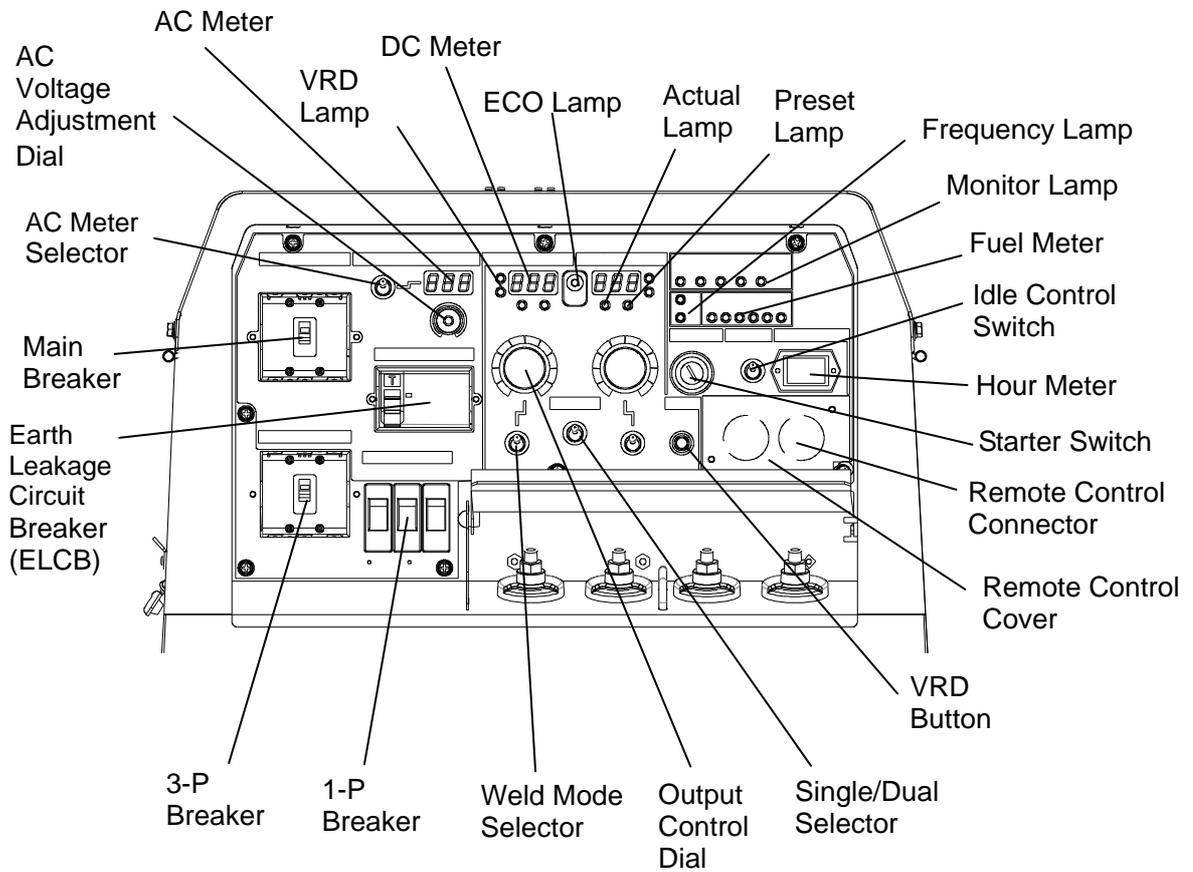
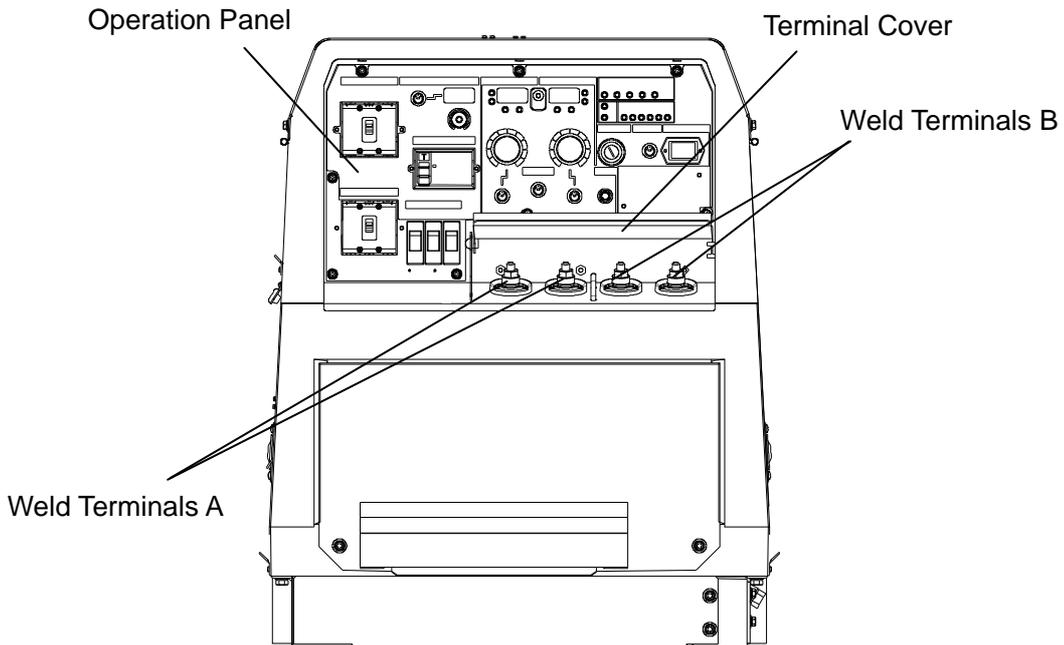
3. Applications

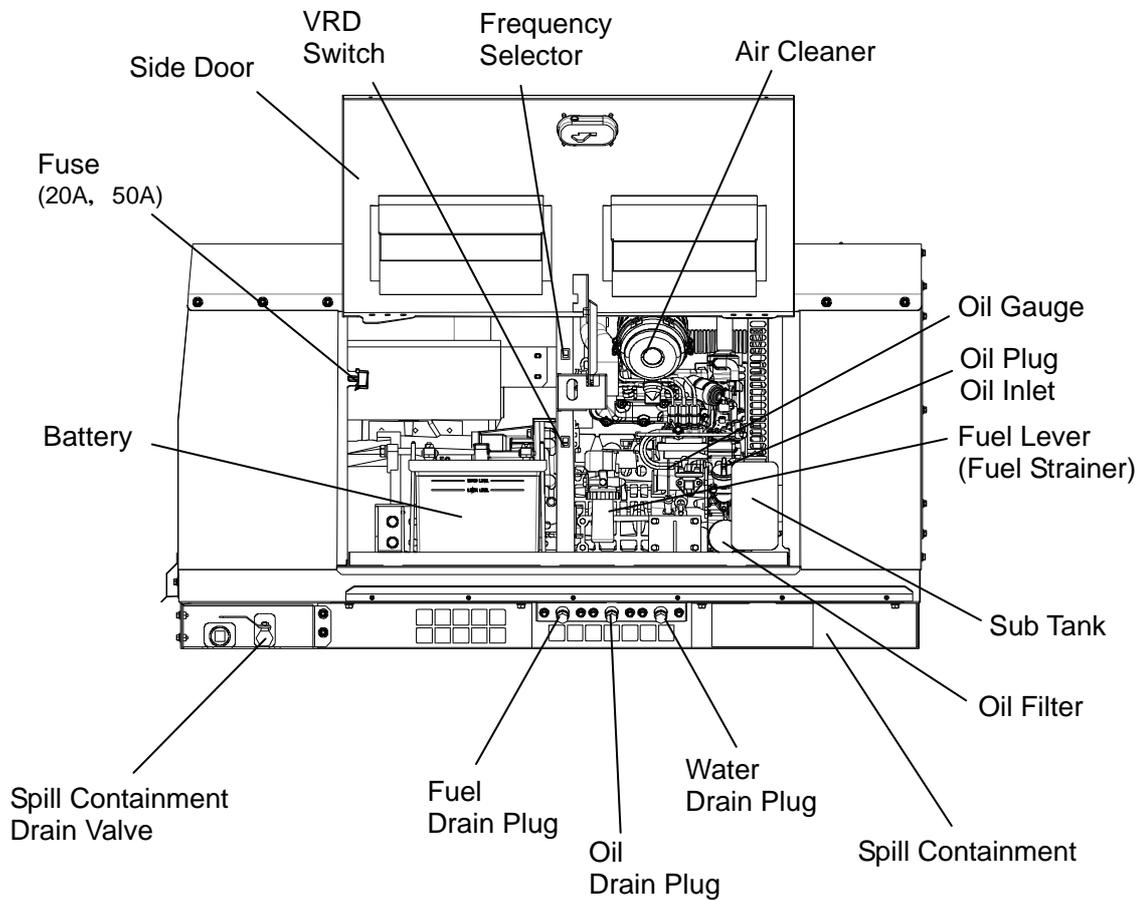
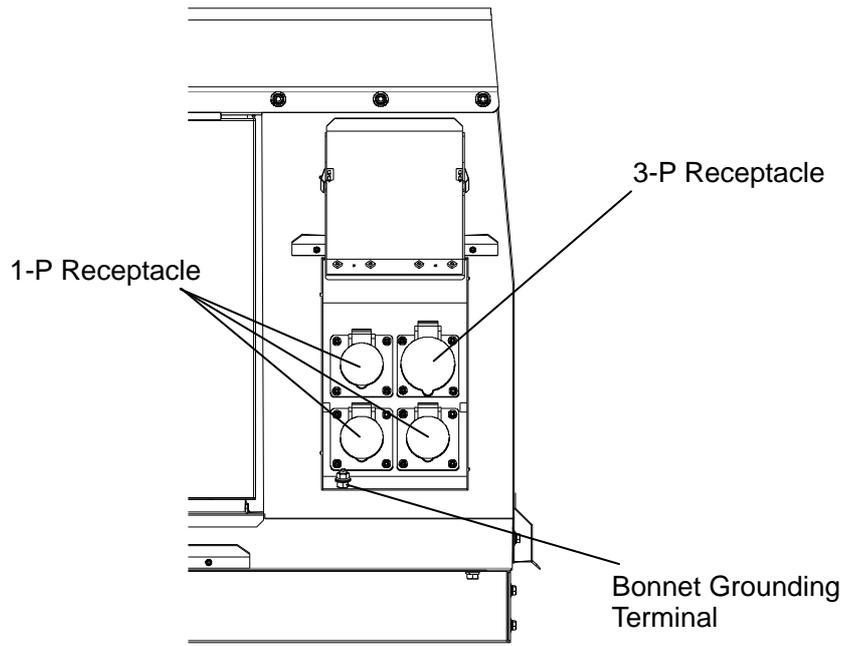
- Shielded Metal Arc Welding
- Scratch Start TIG
- Gouging
- Power Source for Light, Electric Tools and Appliances

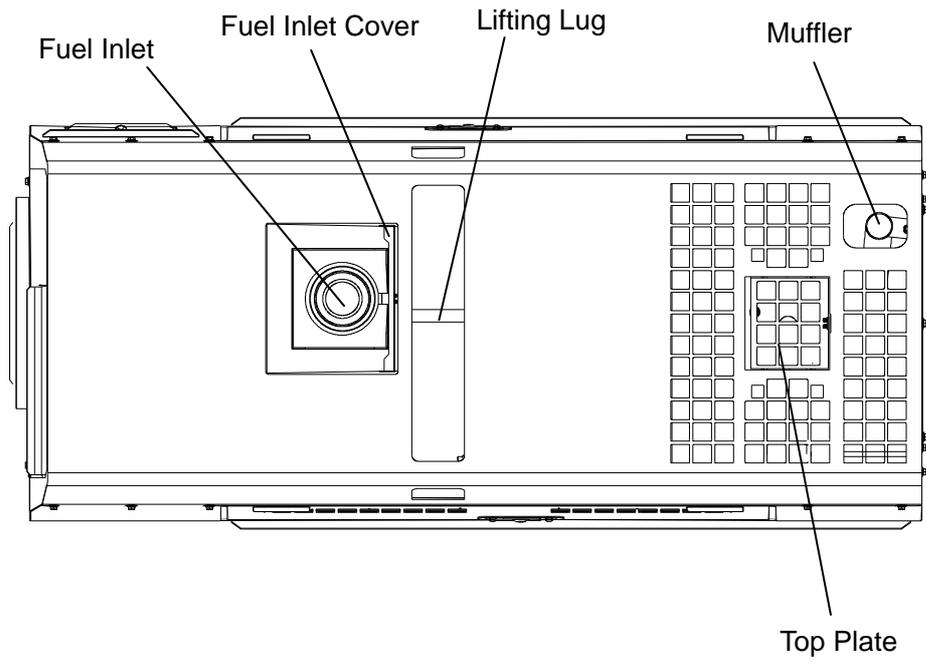
⚠ Caution: Physical and Secondary Damage

- Do not use the equipment for any applications not listed above. Improper usage can result in an accident or malfunction.
- If using the equipment as a power source for medical equipment, you must check with the medical equipment manufacturer, doctor and hospital before using the equipment.

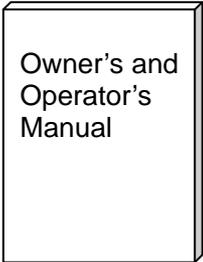
4. Part Names



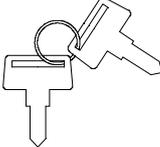




Accessories



Owner's and Operator's Manual



Starter Key 1 Set



Door Key 2 Set

A rectangular box containing three items: a manual, a set of keys, and another set of keys. The manual is on the left, and the two key sets are on the right. Each item is labeled with text below it.

5. Equipment

5-1. Spill Containment

⚠ Warning: Fire

- Always be sure to wipe up any spilled fuel or oil.
- Spilled fuel and oil accumulates in the spill containment. Do not operate the equipment with liquid accumulated in the spill containment.
- Absolutely never use the equipment if there is a fuel, oil or cooling water leak, and be sure to always repair the leak before using.

The equipment includes a spill containment (structure that collects leaking liquid) in order to prevent leaking liquid from getting outside of the equipment if oil, fuel or other liquid should leak.

Before starting operation, check if there is any fluid accumulated in the spill containment and drain any accumulated liquid. (Refer to section "11.(7) Draining Liquid from the Spill Containment" .)

<Note>

- It is necessary to periodically drain the liquid from within the equipment because any rainwater that leaks into the equipment also accumulates in the spill containment.
- Although the fluids that can leak internally consist of oil, fuel and cooling water, the spill containment does not have a function that can separate rainwater that has leaked into the equipment from these internally leaked fluids. Properly dispose of liquid drained from the spill containment in a manner according to the applicable laws and regulations.

5-2. VRD (Voltage Reduction Device)

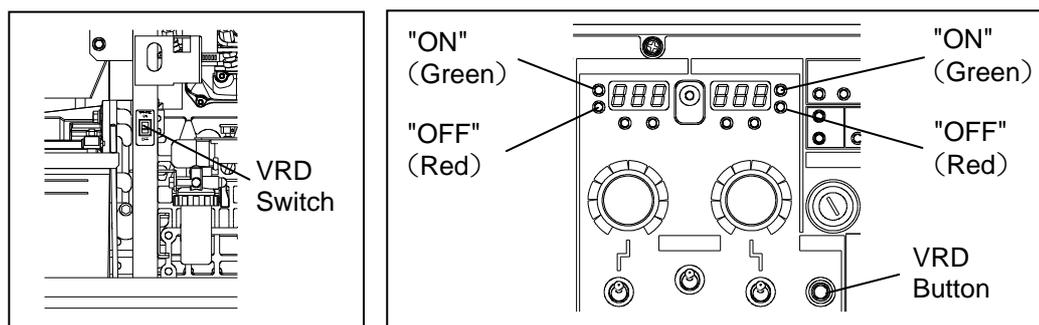
The equipment includes a voltage reduction device on the weld output side. The voltage reduction device reduces the output voltage of the welder when welding is paused in order to further increase safety when welding in locations with high humidity, elevated locations, extremely confined spaces near possible hazards, and similar conditions.

When the VRD switch is set to "ON" and not welding, the voltage reduction device reduces the voltage of the Weld output terminals to 25 V or less.

When welding is started, the voltage-reduction function is cancelled and the equipment returns to the reduced voltage status when welding is completed.

By pushing the VRD button, you can check of the VRD operation.

The green VRD lamp ("ON" side) lights up when weld output voltage is less than 25 V and the red lamp ("OFF" side) lights up when the voltage is 25 V or more.



<Note>

- The VRD is only for weld output. It does not function for AC generated output voltage.

5-3. Idle Control

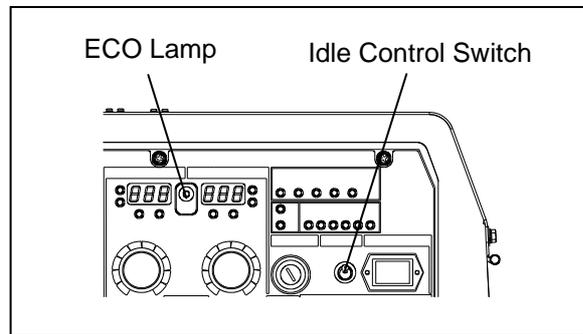
The equipment includes an idle control function. You can use the idle control switch to select an engine speed setting of "ECO" , "AUTO" or "HIGH" .

(1) Eco Drive

The equipment includes an eco drive function in order to reduce noise, save fuel, and reduce exhaust gas emission.

When the idle control switch is set to "ECO" and only welding is being performed, the engine operates at an optimal speed corresponding to the weld output and it automatically returns to low speed when welding is stopped.

The eco lamp lights up during eco drive to indicate that operation is environmentally considerate.



<Note>

- The engine speed optimization function of eco drive is only for welding.
- If using as an AC power source during eco drive (including when welding and using as an AC power source at the same time), the engine operates at high speed and the eco lamp turns off.
- Set the idle control switch to "AUTO" or "HIGH" if welding or using as an AC power source in an intermittent manner.
- Set the idle control switch to "HIGH" if using a high capacity motor, precision instruments or AC load with an attached magnetic switch.
- Set the idle control switch to "HIGH" if using as an AC power source of a device of 1 A or less because the engine might not reach a high speed as speed control does not operate at that level.

(2) Auto Idle

The equipment includes an auto idle function in order to reduce noise, save fuel, and reduce exhaust gas emission.

You can set the idle control switch to "AUTO" so that the engine operates at low speed when not welding or using the equipment as a power source.

When you start to weld or use as an AC power source, the engine automatically increases to high speed. When in a no-load condition, the engine automatically returns to low speed after approximately 8 seconds of high-speed operation.

<Note>

- Set the idle control switch to "HIGH" if using a high capacity motor, precision instruments or AC load with an attached magnetic switch.

- Set the idle control switch to "HIGH" if using as an AC power source of a device of 1 A or less because the engine might not reach a high speed as speed control does not operate at that level.

(3) High Idle

You can set the idle control switch to "HIGH" to maintain the engine constantly at high speed.

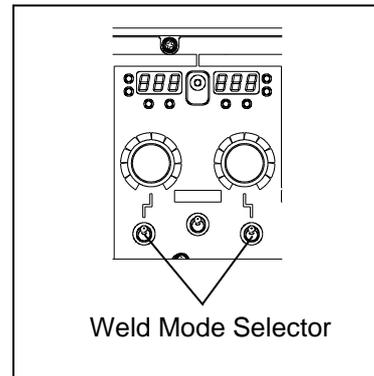
5-4. Weld Mode Selector

You can select a weld mode of "DROOP-STANDARD / GOUGING" , "CC-CELLULOSE / SCRATCH START TIG" in accordance with the type of welding being performed.

■ DROOP(Drooping Characteristic)-STANDARD / GOUGING

The weld current can be adjusted by manipulating the welding rod due to being able to increase or decrease the current for changing the arc length, thereby allowing you to adjust the arc status and weld beads.

The arc start is good and the arc is strongly felt. This mode is optimal for welding work such as pipe welding or when using special welding rods.



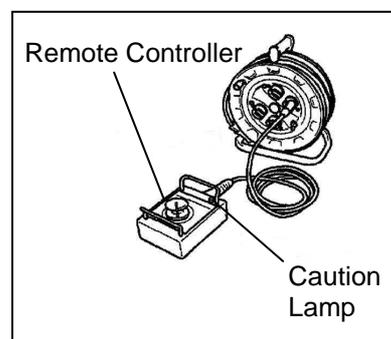
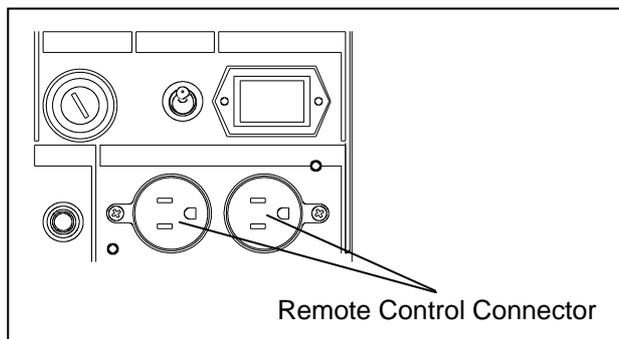
■ CC(Constant Current)-CELLULOSE / SCRATCH START TIG

Welding can be performed at a constant uniform current even if the arc length changes due to a shaky hand or similar cause to provide a stable arc that is not easily extinguished.

Welding can be performed at a specified current value without being affected by the length or thickness (thinness) of the welding cable. This mode is optimal for general welding as the stable arc reduces the amount of spatter.

5-5. Remote Control (Option)

You can connect the remote controller to the remote control connector to enable remote operation of weld current adjustment.



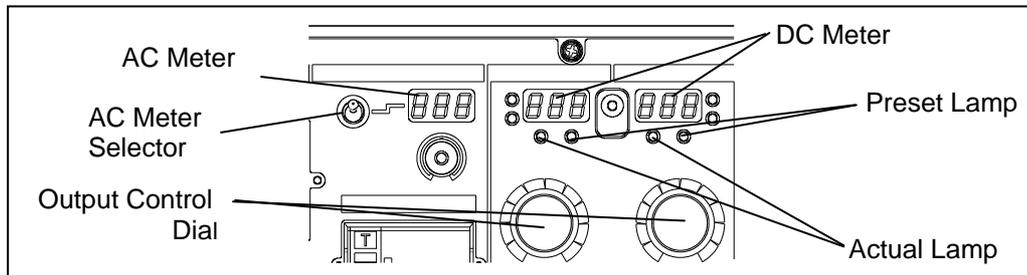
- 1) Remove the remote control cover from the operation panel. (2-M4 screws)
 - 2) Connect the plug of the extension cord (cord reel) into one of the dedicated remote control connector (side A or B).
 - 3) Connect the plug of the remote controller into the receptacle of the extension cord (cord reel).
- Up to 3 cord reels (30 m x 3) can be connected.

<Note>

- The output control dial on the remote controller connection side of the equipment does not function when a remote controller is connected.
- If the remote controller is disconnected from the remote control connector while welding, the equipment output control dial becomes functional, possibly resulting in an increase or decrease in weld current.
- Do not connect the remote controller plug to the receptacle of an extension cord (cord reel) that is connected to AC power source. Improper connection causes the caution lamp of the remote controller to light up indicating a fault.
- Do not connect the receptacle of an extension cord (cord reel) used for the remote control to any other device besides the remote controller.
- Set the breaker to "ON" if the cord reel is equipped with one.

5-6. Meter

The equipment includes a DC meter that provides digital display of weld current, and an AC meter that provides digital display of voltage, current and frequency of 3-phase generated output.



(1) DC Meter

The DC meter display the weld current for both outputs A and B separately. Moreover, the equipment includes a weld output pre-set function. You can pre-set the output current using the output control dial. If the single/dual selector is set to "SINGLE" , the DC meter for output B does not display current.

<Note>

- The set current that has been pre-set using the output control dial is displayed by the DC meter when not welding. ("PRESET" lamp lights up)
- During welding, the DC meter display the actual output current. ("ACTUAL" lamp lights up)

(2) AC Meter

The AC meter is equipped with an AC meter selector that can be switched to display 3-phase voltage, 3-phase current or frequency.

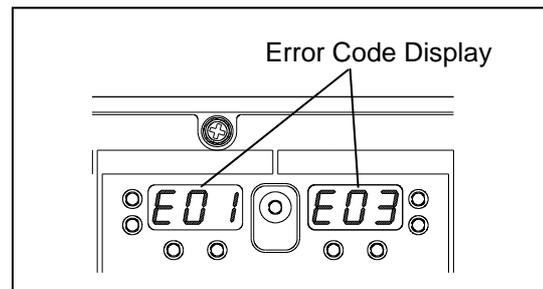
<Note>

- During operation, the 3-phase output voltage of the AC power source is constantly displayed regardless of whether the breaker for 3-phase voltage is set to "ON" or "OFF" .

5-7. Error Code Display

The equipment includes an error code display function that notifies the operator of any errors during operation. If an error is detected during operation, error codes are displayed by the DC meter. If this occurs, stop operation immediately, and inspect and repair the location where the error has occurred.

(Refer to section "13. Troubleshooting" .)



5-8. Monitor Lamp

Warning: Injury/Electric Shock

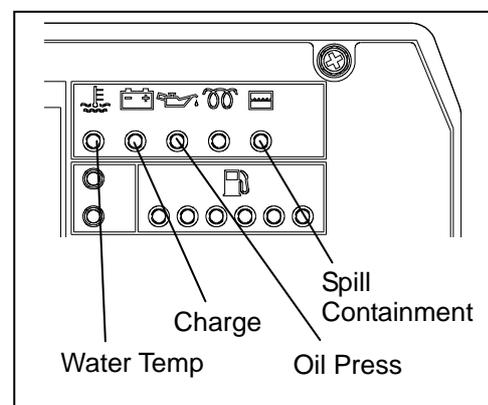
- Do not operate the equipment with any doors or covers open. There is a danger of hair, body parts and other items being caught up in moving parts such as cooling fans and belts.

Caution: Burn

- The engine, muffler and similar parts are extremely hot during operation and immediately after stopping the equipment. Never touch hot parts.
- Never open the radiator cap during operation or immediately after stopping the equipment. Hot cooling water and steam will spurt out.
- Always be sure to stop the engine and allow it to cool before inspecting or changing the engine oil. Opening the oil gauge or oil plug during operation will result in hot oil spurting out.

The equipment includes monitor lamps for "WATER TEMP" , "CHARGE" , "OIL PRESS" and "SPILL CONTAINMENT" . If the equipment is normal, the "CHARGE" and "OIL PRESS" monitor lamps light up when the starter switch is switched from "STOP" to "RUN" , and all monitor lamps turn off when the engine is started. If any error besides that of spill containment occurs during operation, the corresponding monitor lamp lights up and the engine is automatically stopped.

If the engine is automatically stopped, return the starter switch to "STOP" and restart the engine. Watch the lit/unlit status of the monitor lamps the next time an automatic stop occurs and check the error contents.



(1) Water Temperature Monitor Lamp

The water temperature monitor lamp ("WATER TEMP") lights up and the engine is automatically stopped if the cooling water temperature becomes irregularly high during operation. If this occurs, inspect the water level of the sub tank and add cooling water if the water level is insufficient. (Refer to section "6-2. Cooling Water Inspection" .)

If the cooling water in the sub tank is at the specified level, it is probable that overloading is the cause. Use within the rated output.

(2) Battery Charge Monitor Lamp

The battery charge monitor lamp ("CHARGE") lights up and the engine is automatically stopped if battery charge fails during operation. If this occurs, it is probable that there is fan belt damage or a wiring fault. Request repair at the retail outlet where the equipment was purchased.

(3) Oil Pressure Monitor Lamp

The oil pressure monitor lamp ("OIL PRESS") lights up and the engine is automatically stopped if the engine oil pressure drops during operation. If this occurs, inspect the engine oil level and fill with engine oil until it reaches the maximum level.

<Note>

- The oil pressure monitor cannot detect oil deterioration. Change the engine oil periodically. (Refer to section "11.(1) Changing the Engine Oil" .)
- The charge monitor cannot detect battery deterioration or insufficient battery fluid. Inspect the battery fluid level periodically. (Refer to section "6-6. Battery Inspection" .)
- Inspect the fuses if the engine is automatically stopped and none of the monitor lamps ("WATER TEMP", "CHARGE" and "OIL PRESS") light up. (Refer to section "4. Part Names" for fuse location.)
If a fuse has blown, it is probable that there is a fault in an electric part or the wiring. Request repair at the retail outlet where the equipment was purchased.

(4) Spill Containment Monitor Lamp

The spill containment monitor lamp ("SPILL CONTAINMENT") lights up if the level of liquid in the spill containment is approximately 70% full (approx. 36 L) in order to ensure that liquid accumulated in the spill containment does not spill out of the equipment. If this occurs, drain the accumulated liquid from the equipment. (Refer to section "11. (7) Draining Liquid from the Spill Containment" .)

<Note>

- The engine is not stopped if the spill containment monitor lamp lights up during operation.
- When the spill containment monitor lamp lights up during operation, stop the engine, check for fuel, oil and cooling water leakage, and repair as necessary.
- Do not use the equipment with liquid accumulated in the spill containment. Drain the spill containment before using. (Refer to section "11. (7) Draining Liquid from the Spill Containment" .)

5-9. Frequency Selector

Warning: Injury/Electric Shock

- Do not operate the equipment with any doors or covers open. There is a danger of hair, body parts and other items being caught up in moving parts such as cooling fans and belts.

⚠ Caution: Burn

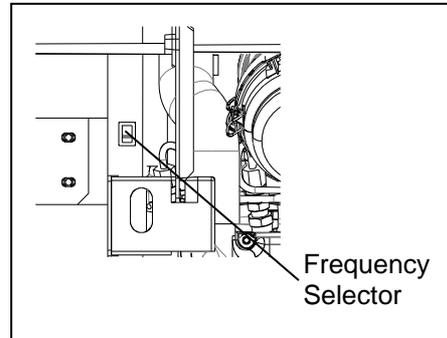
- The engine, muffler and similar parts are extremely hot during operation and immediately after stopping the equipment. Never touch hot parts.

⚠ Caution: Physical and Secondary Damage

- Set the frequency in accordance with the devices using the equipment.

This equipment can operate at either 50Hz or 60 Hz.

Set the frequency selector located inside the side door to change the frequency in accordance with the devices using the equipment.



<Note>

- The frequency lamp lights up on the side of the corresponding set frequency.

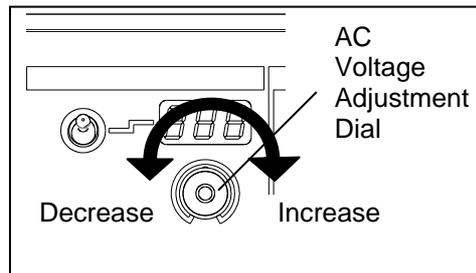
5-10. Voltage Adjustment Dial

Use the dial for adjusting the output voltage of the AC power source when you need to adjust the voltage.

The equipment is normally used with the dial set at the center position.

<Note>

- The output current decreases as the voltage increases. (Use within the rated output range.)
- Setting higher than the allowable voltage of devices using the equipment can result in the malfunction of such devices.



5-11. Earth Leakage Circuit Breaker and Grounding

⚠ Warning: Electric Shock

- Always be sure to repair the corresponding earth leakage location when earth leakage circuit breakers operate.

⚠ Warning: Fire

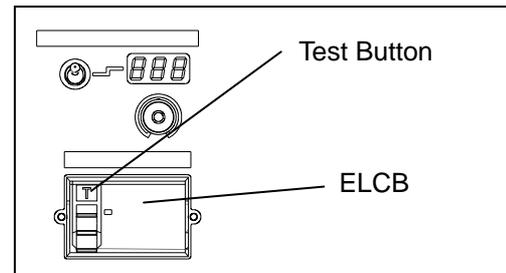
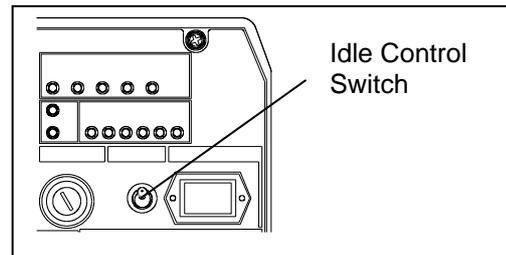
- Do not ground wiring of earth leakage circuit breakers of the equipment to piping that passes through flammable material.

The equipment includes earth leakage circuit breakers (solidly grounded type) in order to prevent electric shock. Immediately isolate the electrical circuit if earth leakage occurs due to insulation failure in devices using the equipment or similar reason.

(1) Operation Check of Earth Leakage Circuit Breakers

Be sure to always check the earth leakage circuit breakers before starting operation according to the following procedures.

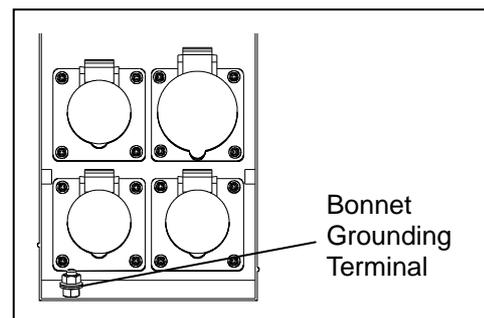
- 1) Start the engine. (Refer to section "7-1. Starting the Engine".)
- 2) Set the idle control switch to "HIGH" .
- 3) Set the ELCB lever to "ON".
- 4) Press the ELCB test button.
Operation is normal if the ELCB lever lowers and turns off at this time.
- 5) Push up the ELCB lever to the "ON" position.



There is a fault in the earth leakage circuit breakers if operation cannot be checked according to the above procedures. Request repair at the retail outlet where the equipment was purchased.

(2) Bonnet Grounding Terminal

The equipment includes a bonnet grounding terminal in order to connect bonnet ground wire. A neutral point of the AC power source is connected to the bonnet grounding terminal.



<Note>

- Connect using a plug with a grounding pole.
- If using a plug without a grounding pole, perform grounding work and check that used devices are connected to ground.
- Securely ground the bonnet grounding terminal to the metal frame of the vehicle if transporting the equipment by truck or trailer.

(3) If an Earth Leakage Circuit Breaker Operates

⚠ Caution: Electric Shock/Injury

- Always be sure to turn off the power switches of all devices using the equipment when turning on the equipment breakers after an earth leakage circuit breaker operates. Leaving on the power switch of a device using the equipment when the equipment breaker is turned on could result in the sudden operation of the corresponding device.

The ELCB lever moves to "OFF" when earth leakage circuit breaker operate. When this occurs, immediately stop the engine and repair the earth leakage location.

After repairing all faults, push up the ELCB lever to the "ON" side to reset the system.

6. Pre-Operation Inspection

⚠ Warning: Injury/Electric Shock

- Do not operate the equipment with any doors or covers open. There is a danger of hair, body parts and other items being caught up in moving parts such as cooling fans and belts.
- Always be sure to stop the engine and remove the starter key before performing any equipment check or maintenance.

⚠ Warning: Fire

- Always be sure to wipe up any spilled fuel or oil.
- Spilled fuel and oil accumulates in the spill containment. Do not operate the equipment with liquid accumulated in the spill containment.
- Absolutely never use the equipment if there is a fuel, oil or cooling water leak, and be sure to always repair the leak before using.
- Absolutely never inspect or perform maintenance to the equipment near fire or other open flame.

⚠ Caution: Burn

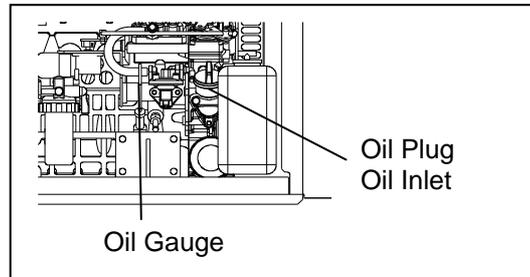
- The engine, muffler and similar parts are extremely hot during operation and immediately after stopping the equipment. Never touch hot parts.

6-1. Engine Oil Inspection

⚠ Caution: Burn

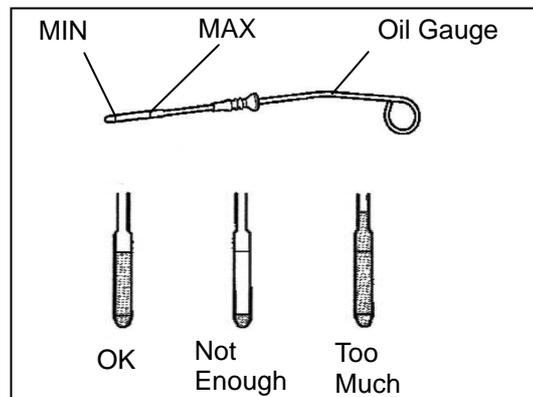
- Always be sure to stop the engine and allow it to cool before inspecting or changing the engine oil. Opening the oil gauge or oil plug during operation will result in hot oil spurting out.

Situate the equipment on a level surface and completely insert the oil gauge to inspect the oil level. Inspect the oil level before starting operation and, if it has decreased, fill with oil until it reaches the maximum level.



<Note>

- The oil level cannot be accurately checked if the equipment is at an angle.
- Operating the equipment when the oil has been filled above the maximum level can result in engine cylinder internal damage.



■ Engine Oil Selection

Use a diesel-type engine oil with a viscosity that is appropriate for the outdoor air temperature (refer to the table).

<Note>

- Use oil with a quality of CD class or better (API classification).

Temperature/Engine Oil Relationship

Temperature	+20°C or more	+10°C~+20°C	-10°C~+40°C
Oil Viscosity	SAE30	SAE20	SAE 10W/30

6-2. Cooling Water Inspection

⚠ Caution: Burn

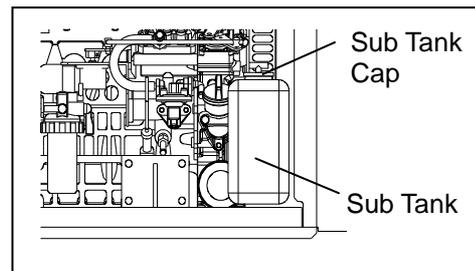
- Never open the radiator cap during operation or immediately after stopping the equipment. Hot cooling water and steam will spurt out.

Check that the sub tank cooling water level is within the range of "FULL" and "LOW" .

If the cooling water level lower than "LOW", add water to both the sub tank and radiator.

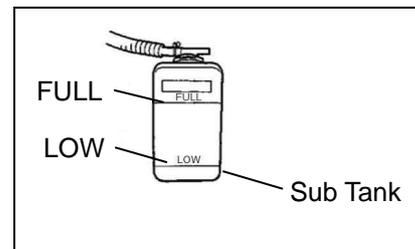
(1) Adding Water to the Sub Tank

- 1) Remove the sub tank cap.
- 2) Pour cooling water into the sub tank until it reaches the "FULL" level.
- 3) Install the sub tank cap.



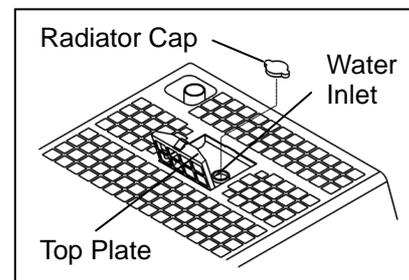
(2) Adding Water to the Radiator

- 1) Open the top plate.
- 2) Remove the radiator cap.
- 3) Pour cooling water into the radiator through the inlet port until it reaches the mouth of the port.
- 4) Tighten the radiator cap.
- 5) Close the top plate.



<Note>

- Use a long-life coolant (LLC) in order to prevent freezing and rust. (An LLC with a 30% mixing ratio is used when shipped from the factory.)
- Use an LLC mixing ratio in the range 30% to 45% in accordance with the outdoor air temperature.
- Change the LLC every 2,000 hours or every 2 years.



Mixing Ratio Guide

Min. Temp.	-15°C	-20°C	-30°C
Mixing Ratio	30%	35%	45%

6-3. Fuel Inspection

⚠ Warning: Fire

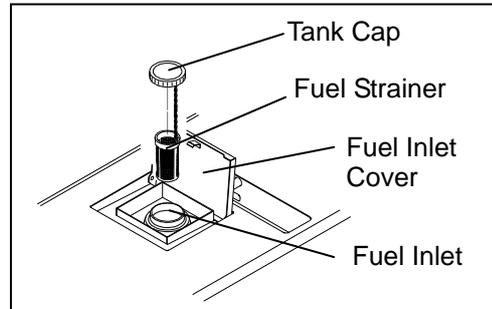
- Always be sure to stop the engine when inspecting fuel or refueling, and absolutely never perform such tasks near fire or other open flame. Wait until the engine has completely cooled before inspecting fuel or refueling.

Check that there is sufficient fuel and add fuel if insufficient.

After refueling, securely tighten the tank cap and close the fuel inlet cover.

<Note>

- Use ASTM D975 No. 2-D diesel fuel. Do not use a substitute fuel of unknown quality as this can negatively affect the engine.
- Use a cold-weather fuel that conforms to ASTM standards if using the equipment in a cold weather region.
- Shindaiwa recommends using a fuel with a sulfur content of less than 1,000 ppm.
- Change the engine oil and oil filter after a shorter period than normal (approximately one-half the normal period) if using a high-sulfur (sulfur content of between 5,000 to 10,000 ppm) fuel.
- Do not use a fuel with a sulfur content of 10,000 ppm or more. Ultra-low sulfur fuel must be used if using the equipment in a region subject to EPA exhaust gas regulations. Use No. 2-D S15 in place of No. 2-D in such areas. Use No. 1-D S15 in place of No. 1-D in regions where the temperature is -10°C or less.
- Always be sure to use the fuel strainer attached to the fuel inlet.
- Add fuel until the tank is slightly less than full.
- Do not open the fuel inlet cover except when refueling. Leaving the fuel inlet cover open can result in rainwater flowing into the equipment and cause the fluids in the spill containment (oil and similar fluids) to spill out of the equipment.



6-4. Spill Containment Inspection

⚠ Warning: Fire

- Spilled fuel and oil accumulates in the spill containment. Do not operate the equipment with liquid accumulated in the spill containment.

Open the side door, check inside of the spill containment, and drain any liquid that has accumulated. (Refer to section "11. (7) Draining Liquid from the Spill Containment" .)

<Note>

- It is necessary to periodically drain the liquid from within the equipment because any rainwater that leaks into the equipment also accumulates in the spill containment.
- Although the fluids that can leak internally consist of oil, fuel and cooling water, the spill containment does not have a function that can separate rainwater that has leaked into the equipment from these internally leaked fluids. Properly dispose of liquid drained from the spill containment in a manner according to the applicable laws and regulations.

6-5. Inspection for Fuel/Oil/Cooling Water Leakage

⚠ Warning: Fire

- Absolutely never use the equipment if there is a fuel, oil or cooling water leak, and be sure to always repair the leak before using.

Open the side door and check for fuel leakage from fuel line joints and similar components, and check for oil and cooling water leakage. Open the fuel tap to perform inspection and close it after inspection has been completed.

6-6. Battery Inspection

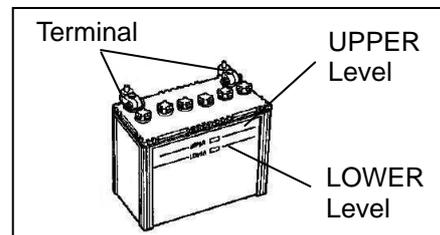
⚠ Warning: Injury to Eyes and Skin

- Use protective gear, such as rubber gloves, when inspecting or replacing the battery due to the dilute sulfuric acid in the battery fluid. Be sure that fluid does not get into eyes, or on skin or clothing.
- If battery fluid gets into the eyes, or on the skin or clothing, immediately wash with a large amount of water, and always be especially sure to seek medical attention if it gets into the eyes.

⚠ Warning: Explosion

- Do not operate the equipment or recharge the battery when the battery fluid level is below the lower level.
- Do not generate any sparks near the battery and do not allow any fire or other open flame near the equipment because the battery generates ignitable gas.

- 1) Inspect the battery fluid level. If it is near the lower level, add distilled water until it reaches the upper level.
- 2) Inspect for loose terminals and retighten if loose.

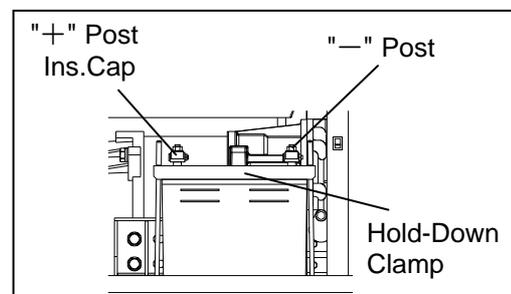


<Note>

- It is necessary to recharge the battery when the specific gravity of the battery fluid is 1.23 or less. Contact the retail outlet where the equipment was purchased if this occurs.

■ Battery Replacement Procedures

- 1) Remove the "-" (negative) cable.
(Always be sure to first remove the "-" (negative) side.)
- 2) Remove the battery hold-down clamp.
- 3) Remove the "+" (positive) cable.
- 4) Remove the battery.



- * Install the battery by performing the above procedures in reverse order. (Always be sure to first attach the "+" (positive) side.)

<Note>

- Use the specified battery. <46B24L> (Japanese Industrial Standard)

7. Operating Procedures

⚠ Warning: Suffocation from Exhaust Fume

- Do not operate the equipment in a poorly-ventilated area such as indoors or within a tunnel because the engine exhaust fume includes components that are harmful to humans.

⚠ Warning: Fire

- Keep any ignitable items (such as fuel, gas and paint) or inflammable items away from the equipment because the muffler, exhaust fume and other parts attain high temperatures.
- Provide at least 1 meter (3 feet) of distance between the equipment and walls and other obstacles, and operate the equipment on a flat surface.

⚠ Caution: Suffocation from Exhaust Fume

- Do not direct the engine exhaust towards passersby, private homes or similar persons/locations because the engine exhaust fume includes components that are harmful to humans.

⚠ Caution: Burn

- The engine, muffler and similar parts are extremely hot during operation and immediately after stopping the equipment. Never touch hot parts.

⚠ Caution: Injury

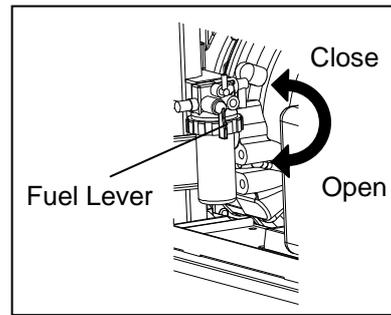
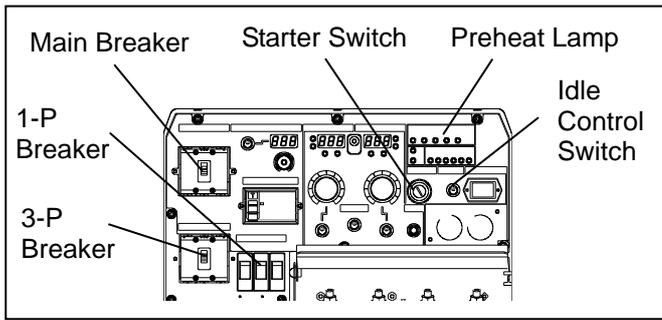
- Use this equipment with it situated on a stable level surface so that it is prevented from moving.
- Do not move the equipment during operation.
- Always be sure to turn off the switches of all devices using the equipment and turn off the equipment breakers before starting the engine.

<Note>

- Check that the surrounding area is safe before starting the engine.
- When there are multiple workers who are working together, they must mutually signal each other before starting the engine.
- Do not use in an area with high temperature or humidity, or an area with a large amount of dust.
- Do not open any doors during operation. Operating with a door open can negatively affect cooling effect, resulting in an equipment malfunction.
- Use ear protection if the level of noise is high. Failure to do so could result in hearing damage.

7-1. Starting the Engine

- 1) Turn all breakers (main, 3-P and 1-P) to "OFF".
- 2) Turn the fuel lever (on the fuel strainer) to "OPEN".
- 3) Set the idle control switch to "ECO" or "AUTO".
- 4) If the temperature is 5°C or less, turn the starter switch to the "PREHEAT" position and wait until the preheat lamp turns off. (Approx. 5 seconds)
- 5) Turn the starter switch to the "START" position to start the starter motor, which then starts the engine.
- 6) After the engine starts, remove your hand from the starter switch.
- 7) Allow the engine to warm up for approximately 5 minutes.



<Note>

- Do not crank the starter motor for 15 seconds or more continuously.
- If repeating starter switch operation, wait 30 seconds or more between operations.
- After the engine starts, do not turn the starter switch to "START" during operation.

■ Restarting after Stopping due to Running Out of Fuel

The equipment includes an automatic air-bleeding device. You can easily restart the engine according to the following procedures even if the engine stops due to running out of fuel.

- 1) Turn all breakers (main, 3-P and 1-P) to "OFF".
- 2) Turn the starter switch to the "STOP" position.
- 3) Add fuel to the fuel tank.
- 4) Set the idle control switch to "ECO" or "AUTO".
- 5) Turn the starter switch to the "START" position and crank the starter motor for approximately 10 seconds.
- 6) After the engine starts, remove your hand from the starter switch.
- 7) Wait for air to be completely bled from the fuel pipes and engine speed to stabilize (approx. 1-minute). (Engine speed is not stable until all air is bled from the fuel pipes.)

<Note>

- Do not switch the engine to high speed or apply any loads to it until all the air has been bled from the fuel pipes (until speed is stable). Doing so can cause a malfunction.

7-2. Stopping the Engine

- 1) Turn all breakers (main, 3-P and 1-P) to "OFF".
- 2) Set the idle control switch to "ECO" or "AUTO".
- 3) Allow the engine to cool down for approximately 5 minutes.
- 4) Set the starter switch to "STOP".
- 5) After the engine stops, turn the fuel lever to "CLOSE".

<Note>

- Do not stop the engine while welding or using as an AC power source. Doing so can cause a malfunction.
- If the engine does not stop when the starter switch is set to "STOP", turn the fuel lever to "CLOSE". The engine will stop a few minutes afterwards. If the engine does not stop by starter switch operation, stop using the equipment and request repair at the retail outlet where the equipment was purchased.

8. Using as a Welder

8-1. Welding Cable Selection

Use welding cables with a cross-sectional area that is larger than the proper cross-sectional areas indicated in the table below.

Using cable that is less than the proper cross-sectional area reduces the weld output.

<Note>

- Use welding cables when they are completely extended (not coiled). Using a cable that is coiled reduces the weld output.

Proper Cable Cross-Sectional Area (Units : mm²)

Weld Current	Return Length					
	20m	30m	40m	60m	80m	100m
400A	38	50	60	100	125	200
350A	30	50	60	80	125	150
300A	30	38	50	80	100	125
250A	22	30	38	60	80	100
200A	22	30	30	50	60	80
150A	22	22	22	38	50	60
100A	22	22	22	30	30	38

8-2. Welding Polarity

There are "+" (positive) and "-" (negative) weld output terminals.

Refer to the table below to select a polarity corresponding to the work you are performing.

<Note>

- Use the polarity indicated for the welding rods being used if so indicated.
- When welding with 2 persons using different polarities for the same base material, a single worker must not hold 2 holders because the voltage between the 2 holders could become high and there may be a danger.

Polarity	Rod Indication	Application	Connecting Method
Straight Polarity	DC-	<ul style="list-style-type: none"> • Shielded metal arc welding of structures and similar items • Scratch start TIG welding 	+(positive) terminal : Earth (Base material) -(negative) terminal : Holder (welding rod)
Reverse Polarity	DC+	<ul style="list-style-type: none"> • Shielded metal arc welding of laminates, weld overlays, stainless steel and similar materials • Gouging 	+(positive) terminal : Holder (welding rod) -(negative) terminal : Earth (Base material)

8-3. Welding Cable Connection

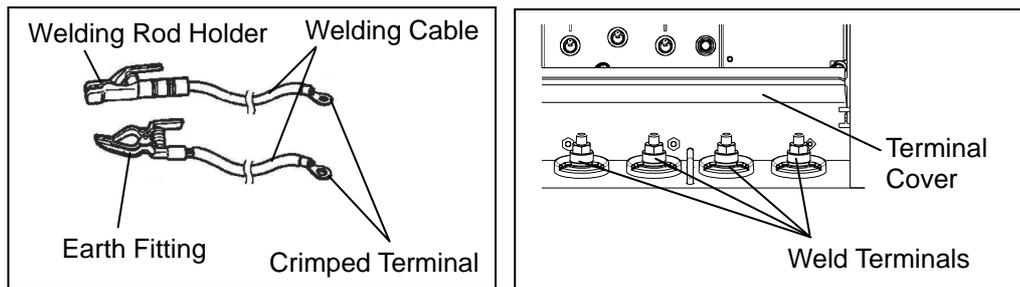
⚠ Warning: Electric Shock

- Be sure to stop the engine whenever touching weld output terminals such as when installing or removing welding cables.
- Do not connect welding cables to any part other than weld output terminals.

- 1) Stop the engine.
- 2) Install the welding cables, crimped terminals, welding rod holders and earth fittings.
- 3) Connect the welding cables to the weld terminals.
(Refer to the table below for cable connection locations.)
- 4) Close the terminal cover.

Amount of Welding Personnel and Welding Cable Connection Locations

Operation	Single	Dual
Welding rod	φ2.6mm~φ8.0mm	φ2.0mm~φ4.0mm
Gouging rod	φ3.2mm~φ8.0mm	φ3.2mm~φ5.0mm
Weld terminals	A side	A side or B side



<Note>

- Securely crimp the crimped terminals and securely connect the welding cables. Using insufficiently crimped terminals or loosely connected cables can result in heat generation from poor connection, thereby causing burnout of the weld output terminals.
- Be sure to always securely crimp the crimped terminals on the cables connected to the Weld output terminals. Not using crimped terminals and simply wrapping stripped cable around the weld output terminal can result in heat generation from poor connection, thereby causing burnout of the weld output terminals and a short circuit due to contact of the cable core with the equipment body.
- Keep your welding cable and electrode holder in good condition. Repair or replace any damaged insulation.

8-4. Duty Cycle

The duty cycle is the percentage of time the load is being applied in a 10-minute period. For example a 60% duty cycle, represents 6 minutes of load and 4 minutes of no load in a 10-minute period.

<Note>

- Continuing to weld beyond the rated duty cycle with the rated output can result in equipment overheating and corresponding malfunctions.

8-5. Welding Work

⚠ Warning: Suffocation from Welding Fume

- Always be sure to wear a fume-proof mask when welding as the fumes generated during welding include harmful gases and dust. Also be careful that the wind direction is not such that it will cause fumes to be inhaled and always operate the equipment in a well-ventilated area.

⚠ Warning: Fire

- Keep any ignitable items (such as fuel, gas and paint) or inflammable items away from the work area due to the scattering of weld spatter that occurs during welding.

⚠ Warning: Electromagnetic Interference

- Persons using a heart pacemaker are not allowed near the welder or welding work area while welding is being performed without the permission of a doctor. The welder generates a magnetic field while energized that can negatively affect pacemaker operation.

⚠ Caution: Injury to Eyes and Skin

- Always be sure to wear arc-proof glasses (refer to the table below), clothes that completely cover the skin and other protective gear when welding to protect the eyes and skin from harmful light rays generated during welding.

Standards for Arc-Proof Glasses (Japanese Industrial Standard)

Filter No.		7	8	9	10	11	12	13	14
Weld Current (A)	Shielded Metal Arc Welding	35-75		76-200		201-400			400
	Scratch Start TIG Welding	—	—	100 or less		100-300		301-400	
	Gouging	—	—	—	126-225		226-350		—

- Always be sure to wear leather gloves, apron, shoe covers, arc-proof glasses (face shield), safety shoes, hard hat and long-sleeve clothing to protect against the scattering of weld spatter that occurs during welding.

⚠ Caution: Electric Shock

- If wearing gloves, be sure to always wear gloves with dry insulation properties. Do not wear gloves that are damaged or wet.

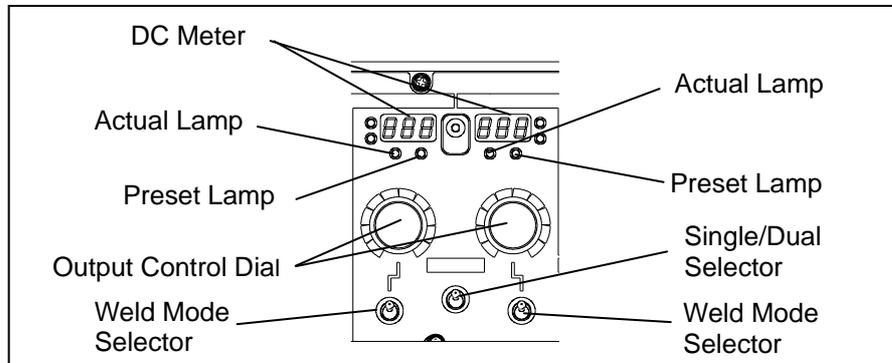
You can select a weld mode with the type of welding being performed. Select a weld mode by referring to the recommended modes in the table below.

Weld Modes Table (Recommended)

Mode Name	Applications	Welding Position
DROOP-STANDARD/ GOUGING	<ul style="list-style-type: none"> •Welding of pipes, tanks and similar items •Gouging 	Vertical and Upward
CC-CELLULOSE/ SCRATCH START TIG	<ul style="list-style-type: none"> •Welding of structures and finishing welding •TIG welding 	Horizontal and Downward

<Note>

- This equipment allows for 2 person simultaneous welding. For 2 person simultaneous welding, select a weld mode and adjust the weld current in accordance with each type of welding work being performed.
- The range of weld current that can be adjusted using the output control dial varies depending on the positions of the single/dual selector and frequency selector. (Refer to section "2. Specifications" .)



- 1) Switch the single/dual selector and frequency selector in accordance with the amount of welding personnel and desired weld output.
- 2) Switch the weld mode selector in accordance with the work being performed.
- 3) Adjust the output current using the output control dial.

The set current that has been pre-set using the output control dial is displayed by the DC meter when not welding. ("PRESET" lamp lights up)
During welding, the DC meter display the actual output current. ("ACTUAL" lamp lights up)

9. Using as a Generator

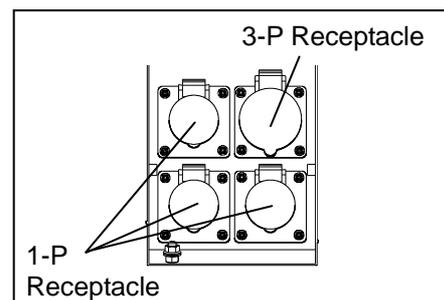
9-1. Output Types and Ranges

(1)3-Phase

The equipment includes one 3-phase receptacle.

The maximum output available from the receptacle is 400V-12kVA at 50Hz.

The maximum output available from the receptacle is 440V-15kVA at 60Hz.



(2)1-Phase

The equipment includes three 1-phase receptacles.

The total maximum output available from the three receptacles is 230V-9.6kVA at 50Hz.

The total maximum output available from the three receptacles is 250V-11.3kVA at 60Hz.

9-2. Usable Device Capacities

Usable capacity varies depending on the type and performance of the electrical tool or household appliance being used.

Overview of Usable Device Capacities (50/60Hz)

Device Used	Standard Capacities (Units : kW)		
	1-Phase 230/250V		3-Phase 400/440V
	Capacity per one Receptacle	Total capacity of three Receptacles	Capacity per one Receptacle
Incandescent bulbs, electrical heaters and similar devices	3.5 / 3.8	9.6 / 12.0	—
Electrical tools (commutator motor) and similar devices	1.7 / 1.9	4.8 / 6.0	—
Mercury lamps (high power factor types)	1.4 / 1.5	3.8 / 4.8	—
Submerged pump, compressor and similar devices (Induction motors)	1.4 / 1.5	3.8 / 4.8	4.8 / 6.0

* Commutator motors: Motors with brushes

* Induction motors: Motors without brushes

* Capacity values are displayed under "OUTPUT" for induction motors and under "POWER CONSUMPTION" for all other devices.

<Note>

- Be sure to use the frequency designated in the equipment incorporated in mercury bulb or induction motor.
- Devices using a motor might require power that is larger than the device rating. In such cases, consult with the retail outlet where the equipment was purchased.
- Do not start up multiple devices simultaneously if using two or more units of devices such as submerged pumps. Start each unit separately.
- Do not light up a mercury lamp again immediately after turning it off. Wait for the lamp to cool down (approximately 15 minutes) after a lamp has been turned off before turning it on again.

9-3. Operation

Warning: Electric Shock

- Always be sure to turn off all breakers before installing or removing devices using AC output receptacles.
- Always be sure to repair the corresponding earth leakage location when earth leakage circuit breakers operate.

Caution: Injury

- Always be sure to turn off the power switches of all devices using the equipment when turning on the equipment breakers. Leaving on the power switch of a device using the equipment when the equipment breakers are turned on could result in the sudden operation of the corresponding device.
- Do not leave on the power switch of a device using the equipment and do not connect a device to an AC output receptacle.

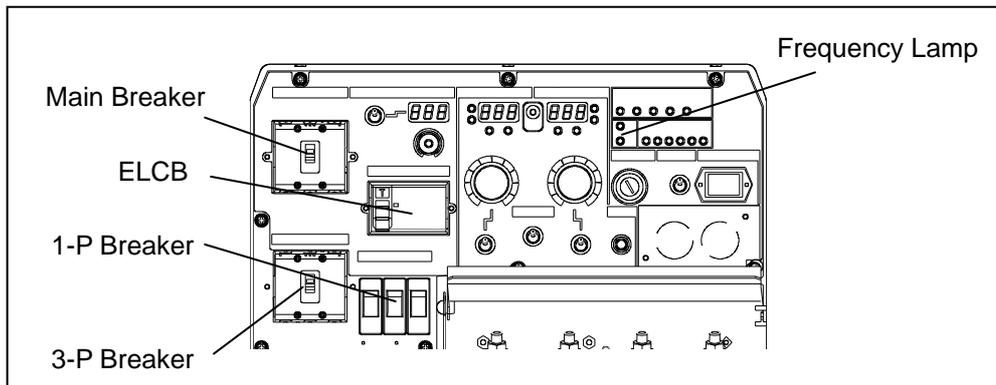
⚠ Caution: Physical and Secondary Damage

- If using the equipment as a power source for medical equipment, you must check with the medical equipment manufacturer, doctor and hospital before using the equipment.
- Set the frequency in accordance with the devices using the equipment.

- 1) Switch the frequency selector in accordance with the devices using the equipment. (Refer to section "5-9. Frequency Selector" .)
- 2) Turn off the switches of devices being used.
- 3) Turn all breakers (main, 3-P and 1-P) to "OFF".
- 4) Start the engine. (Refer to section "7-1. Starting the Engine".)
- 5) Check the frequency with a frequency lamp.
- 6) Connect the power plug(s) of device(s) being used to the AC output receptacle(s).
- 7) Turn all breakers (main, 3-P and 1-P) to "ON".
(Check that the ELCB lever is set to "ON" .)

<Note>

- During operation, the 3-phase output voltage of the AC power source is constantly displayed by the AC meter voltage display regardless of whether the breaker is set to "ON" or "OFF" .



■ Recovery from Overcurrent Breaker Operation

⚠ Caution: Injury

- Always be sure to turn off the power switches of all devices using the equipment when turning on the equipment breakers. Leaving on the power switch of a device using the equipment when the equipment breakers are turned on could result in the sudden operation of the corresponding device.

Breakers operate when there is excessive current to isolate the corresponding circuit.

Inspect the breakers if a device being used stops during equipment operation.

Follow the following procedures to recover operation when breakers operate due to overcurrent.

- 1) Turn off all switches of devices using the equipment as an AC power source.
- 2) Push up the breaker lever that have operated to the "ON" position.

<Note>

- Refer to section "9-2. Usable Device Capacities" and be careful of overloading.

10. Simultaneously Welding and Using as AC Power Source

Due to the fact that breakers only function for AC power output, the engine can become overloaded if simultaneously welding and using the equipment as an AC power source.

Refer to the table below and limit the use of AC power accordingly.

Overview of Capacities Usable Simultaneously (50/60Hz)

Weld Output			AC Power Output		
Amount of Personnel	Welding Rod	Current	3-Phase (Power Factor 0.8)		1-Phase (Power Factor 1.0)
Used by 1 Person "SINGLE" or "DUAL"	φ2.0	60A	10.5/12 kVA		8.5/10 kW
	φ2.6	120A	8.5/10 kVA		7.0/8.5 kW
	φ3.2	140A	7.5/9.5 kVA		6.0/8.0 kW
	φ4.0	170A	6.0/8.5 kVA		5.0/7.0 kW
	φ5.0	240A	3.0/5.5 kVA		2.5/4.5 kW
	φ6.0	300A	1.0/2.5 kVA		0.5/2.0 kW
	φ8.0	380A	0/0 kVA		0/0 kW
Used by 2 Persons "DUAL"	φ2.0	60Ax2	8.5/10.5 kVA		7.0/8.5 kW
	φ2.6	120Ax2	4.0/6.5 kVA		3.5/5.5 kW
	φ3.2	140Ax2	3.0/5.0 kVA		2.5/4.0 kW
	φ4.0	170Ax2	1.0/2.5 kVA		0.5/2.0 kW

PLUS

OR

* 1-Phase output is the total output of three receptacles.

<Note>

- Do use as an AC power source simultaneously with welding if it is necessary to perform high-quality welding.

11. Inspection/Maintenance

⚠ Warning: Electric Shock/Injury

- Do not touch the equipment during operation if the equipment or your body is wet.
- Always be sure to stop the engine and remove the starter key before performing any equipment check or maintenance.
- Do not operate the equipment with any doors or covers open. There is a danger of hair, body parts and other items being caught up in moving parts such as cooling fans and belts.
- Do not modify the equipment and do not operate with parts removed.

⚠ Warning: Fire

- Always be sure to stop the engine when inspecting fuel or refueling, and absolutely never perform such tasks near fire or other open flame. Wait until the engine has completely cooled before inspecting fuel or refueling.
- Always be sure to wipe up any spilled fuel or oil.
- Spilled fuel and oil accumulates in the spill containment. Do not operate the equipment with liquid accumulated in the spill containment.
- Absolutely never use the equipment if there is a fuel, oil or cooling water leak, and be sure to always repair the leak before using.
- Absolutely never inspect or perform maintenance to the equipment near fire or other open flame.

⚠ Warning: Injury to Eyes and Skin

- Use protective gear, such as rubber gloves, when inspecting or replacing the battery due to the dilute sulfuric acid in the battery fluid. Be sure that fluid does not get into eyes, or on skin or clothing.
- If battery fluid gets into the eyes, or on the skin or clothing, immediately wash with a large amount of water, and always be especially sure to seek medical attention if it gets into the eyes.

⚠ Warning: Explosion

- Do not operate the equipment or recharge the battery when the battery fluid level is below the lower level.
- Do not generate any sparks near the battery and do not allow any fire or other open flame near the equipment because the battery generates ignitable gas.

⚠ Caution: Burn

- The engine, muffler and similar parts are extremely hot during operation and immediately after stopping the equipment. Never touch hot parts.
- Never open the radiator cap during operation or immediately after stopping the equipment. Hot cooling water and steam will spurt out.
- Always be sure to stop the engine and allow it to cool before inspecting or changing the engine oil. Opening the oil gauge or oil plug during operation will result in hot oil spurting out.

<Note>

- Procedures except for pre-operation inspection must be performed by specialized technicians.
- Items indicated by ●: Contact the retail outlet where the equipment was purchased.
- Always be sure to use genuine parts when replacing parts.
- When removing waste liquid from the equipment, place some container to collect the liquid and prevent it from spilling on the ground. Dispose of such oil, fuel, cooling water (LLC), filters, batteries and other harmful substances as industrial waste in accordance with applicable laws and regulations. Consult with the retail outlet where the equipment was purchased if you have any inquiries regarding proper disposal.
- When performing maintenance with doors or covers open, be sure that no other persons can accidentally come close to the equipment. Close all doors and covers if momentarily leaving the equipment unattended.

Perform periodic inspection and maintenance as indicated by the table below in order to ensure that this equipment can be operated in optimal condition.
Use the hour meter as a general indicator for the operating time.

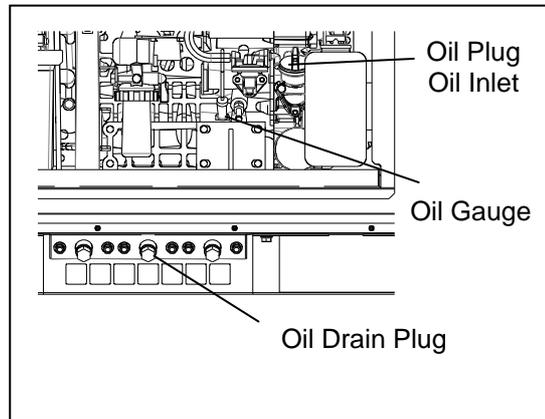
Inspection Item		Pre-Operation Inspection	Inspection Period					Every 2,000 hours
			50th hour	Every 100 hours	Every 200 hours	Every 400 hours	Every 1,000 hours	
1	Inspect/Add Fuel	○						
2	Inspect/Add Engine Oil	○						
3	Change Engine Oil		1st time ○	2nd time and after ○				
4	Change Oil Filter		1st time ○		2nd time and after ○			
5	Inspect/Add Cooling Water	○						
6	Change Cooling Water							○ Or 2years
7	Clean Fuel Strainer		1st time ○	2nd time and after ○				
8	Replace Fuel Element					○		
9	Drain Water from/Clean Fuel Tank					○		
10	Inspect for Fuel/Oil/Cooling Water Leakage	○						
11	Inspect/Add Battery Fluid	○						
12	Clean Air Element		1st time ○	2nd time and after ○				
13	Replace Air Element					○		
14	Drain Liquid from Spill Containment	○						
15	Adjust V-belt Tension		1st time ●	2nd time and after ●				
16	Replace V-belt					● Or 2years		
17	Clean Radiator Fin (External)					●		
18	Clean Radiator (Internal)					●		
19	Replace Fuel/Cooling Water/Oil Hoses and Anti-Vibration Rubber							● Or 2years

Inspection Item	Pre-Operation Inspection	Inspection Period					
		50th hour	Every 100 hours	Every 200 hours	Every 400 hours	Every 1,000 hours	Every 2,000 hours
20	Adjust/Lap Clearance of Air Intake/Release Valves					● Adjustment	● Lapping
21	Inspect/Adjust Clearance of Fuel Injection Valves				●		
22	Inspect/Adjust Fuel Injection Pump						●
23	Clean/Inspect Spill Containment				● Or 1years		

(1) Changing the Engine Oil

1st time	50th hour
2nd time and after	Every 100 hours

- 1) Remove the oil plug.
- 2) Remove the oil drain plug and drain the engine oil.
- 3) Tighten the oil drain plug.
- 4) Add oil through the oil inlet, while checking the oil level using the oil gauge, until it reaches the maximum level. (Fill with approx. 3.6 L.)
- 5) Tighten the oil plug.



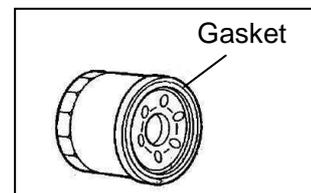
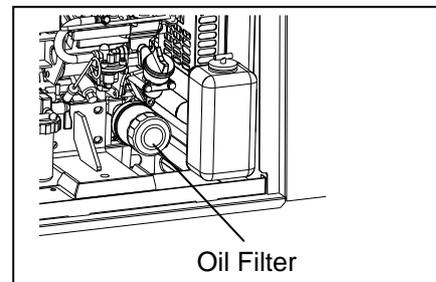
<Note>

- Refer to section "6-1. Engine Oil Inspection" for the types of engine oil.
- Replace the packing of the oil drain plug with a new part each time the oil is changed.
- Packing part no.: 6C090-58961 (Kubota part no.)
- After tightening the oil drain plug, operate the engine for a short period and check that there is no oil leakage. Stop the engine when completed.

(2) Changing the Oil Filter

1st time	50th hour
2nd time and after	Every 200 hours

- 1) Drain the engine oil according to the procedures of " (1) Changing the Engine Oil".
- 2) Remove the oil filter using a filter wrench.
- 3) Apply a thin layer of oil to the gasket of a new oil filter.



- 4) Screw in the oil filter by hand and securely tighten by hand (do not use a filter wrench) after the gasket contacts the seal surface.
- 5) Add engine oil.

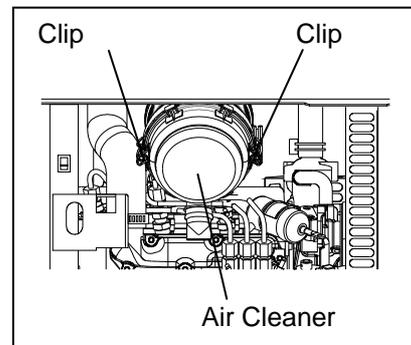
<Note>

- Contact the retail outlet where the equipment was purchased if you do not have a filter wrench.
- Oil filter part no.: 15853-32436 (Kubota part no.)
- After adding engine oil, operate the engine for a short period and check that there is no oil leakage. Stop the engine when completed.

(3) Cleaning/Replacing the Air Element

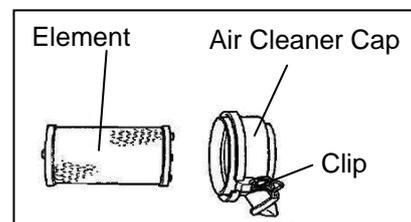
Cleaning	1st time: 50th hour 2nd time and after: Every 100 hours
Replacement	Every 400 hours

- 1) Release the air cleaner clips and remove the cleaner cap.
- 2) Clean or replace the air element.
 < If dry dust is adhering >
 Spray compressed air from within the element.
 < If carbon or oily substance is adhering >
 Replace with a new part.
- 3) Install in the reverse order of removal.



<Note>

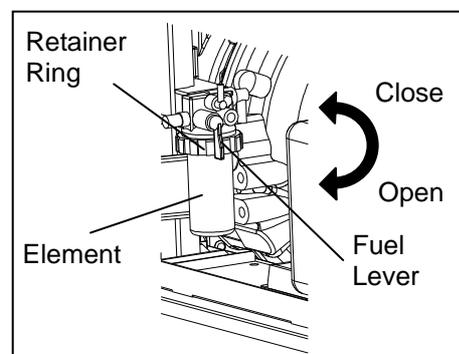
- Clean sooner than scheduled if using the equipment in a dusty location.
- Element part no.: 1G319-11211(Kubota part no.)



(4) Cleaning/Replacing the Fuel Strainer

Cleaning	1st time: 50th hour 2nd time and after: Every 100 hours
Replacement	Every 400 hours

- 1) Turn the fuel lever to "CLOSE".
- 2) Turn the retainer ring to the left and remove the cup and element.
- 3) Remove any water or foreign material from the cup and clean the element using compressed air. (Or replace the element.)
- 4) Install in the reverse order of removal.



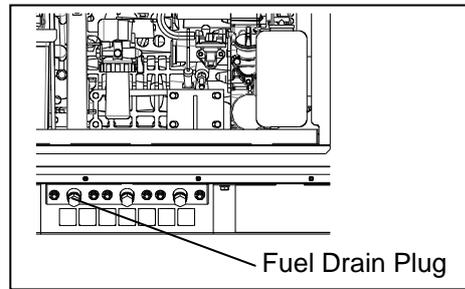
<Note>

- Check that no foreign material is adhering to the packing then install the cup.
- After installation, turn the fuel lever to "OPEN" and check that there is no fuel leakage. After checking, turn the fuel lever to "CLOSE" .
- Element part no.: 16271-43561 (Kubota part no.)

(5) Draining Water from the Fuel Tank

Draining Water	Every 200 hours
----------------	-----------------

- 1) Remove the fuel drain plug.
- 2) Drain the water and tighten the fuel drain plug.



<Note>

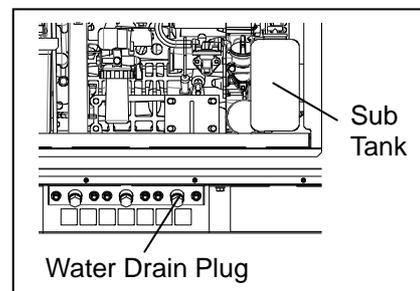
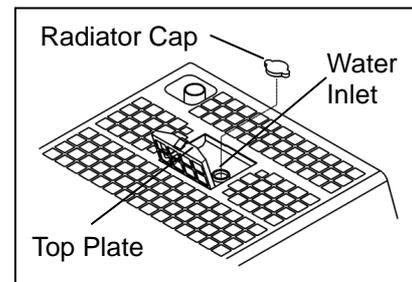
- Replace the packing with a new part each time you drain the water.
- Packing part no.: 6C090-58961 (Kubota part no.)
- Always be sure to check that there is no fuel leakage after tightening the fuel drain plug.

(6) Changing the Cooling Water

Change	Every 2,000 hours or 2 years
--------	------------------------------

Cooling Water Total Capacity: Approximately 4 L
(Including the sub tank capacity of approx. 0.6 L)

- 1) Open the top plate.
- 2) Remove the radiator cap.
- 3) Remove the water drain plug.
- 4) Drain the cooling water and tighten the water drain plug.
- 5) Change the cooling water in the sub tank.
- 6) Pour cooling water into the water inlet until it reaches the mouth of the port.
- 7) Tighten the radiator cap.
- 8) Close the top plate.



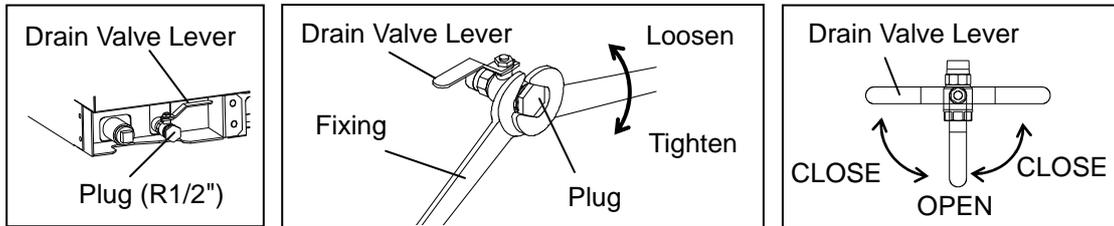
<Note>

- Replace the packing with a new part each time you change the cooling water.
- Packing part no.: 6C090-58961 (Kubota part no.)
- Operate the engine for a short period and check that there is no cooling water leakage. Stop the engine when completed.

(7) Draining Liquid from the Spill Containment

Drain	Pre-operation
-------	---------------

- 1) Set a receptacle under the drain port of the spill containment to catch the liquid.
- 2) Remove the plug (R 1/2") of the spill containment drain valve and turn the lever to "OPEN".
- 3) After draining the liquid, turn the lever to "CLOSE", and apply sealing agent to the plug (R 1/2") or wrap it with sealing tape before tightening the plug.



<Note>

- Secure the drain valve body using a spanner or similar tool so that it does not loosen when removing/installing the plug by turning it.
- It is possible that there is a fuel or oil leak if the drained fluid contains oily components. If this occurs, check for leakage locations.
- Although the fluids that can leak internally consist of oil, fuel, cooling water and battery fluid, the spill containment does not have a function that can separate rainwater that has leaked into the equipment from these internally leaked fluids. Properly dispose of liquid drained from the spill containment in a manner according to the applicable laws and regulations.

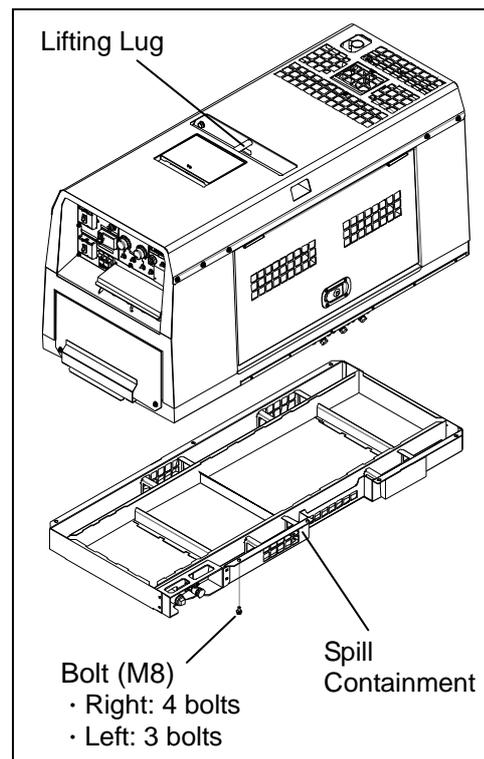
(8) Cleaning/Inspecting the Spill Containment

Clean / Inspect	Every 400 hours or 1 year
-----------------	---------------------------

⚠ Caution: Injury

- Always be sure to use the lifting lug when lifting the equipment, and lift slowly and directly straight above.
- Wear a helmet, safety shoes, gloves and similar protective gear when performing lifting work. Do not stand or get under the equipment while it is suspended.
- For cleaning/inspecting the spill containment, set this equipment with it situated on a stable level surface so that it is prevented from moving.

- 1) Drain the liquid from the spill containment.
- 2) Remove the seven installation bolts (M8) of the spill containment.
- 3) Lift up the equipment body to separate the spill containment and set the equipment on a level surface.
- 4) Clean the inside of the spill containment using a high-pressure washer or similar equipment.
- 5) Drain the cleaning liquid from the spill containment.
- 6) Remove any rust that has formed in the spill containment and paint it again.



- 7) Pour water into the spill containment and check that there is no leakage.
(After checking, drain the water you have used.)
- 8) Install the spill containment to the equipment in the reverse order of removal.

<Note>

- Do not operate the equipment with the spill containment separated.
- If liquid drained from the spill containment during cleaning contains oily components, dispose of it in a manner according to the applicable laws and regulations.
- If the spill containment has a leak, request repair at the retail outlet where the equipment was purchased.

12. Long-Term Storage

⚠ Warning: Electric Shock/Injury

- Always be sure to stop the engine and remove the starter key before performing any equipment check or maintenance.
- Do not operate the equipment with any doors or covers open. There is a danger of hair, body parts and other items being caught up in moving parts such as cooling fans and belts.
- Do not modify the equipment and do not operate with parts removed.

⚠ Warning: Fire

- Always be sure to stop the engine when inspecting fuel or refueling, and absolutely never perform such tasks near fire or other open flame. Wait until the engine has completely cooled before inspecting fuel or refueling.
- Always be sure to wipe up any spilled fuel or oil.
- Spilled fuel and oil accumulates in the spill containment. Do not operate the equipment with liquid accumulated in the spill containment.

⚠ Caution: Burn

- The engine, muffler and similar parts are extremely hot during operation and immediately after stopping the equipment. Never touch hot parts.
- Always be sure to stop the engine and allow it to cool before inspecting or changing the engine oil. Opening the oil gauge or oil plug during operation will result in hot oil spurting out.

Perform the following maintenance procedures if not using the equipment for two months or more.

- 1) Remove the battery. (Refer to section "6-6. Battery Inspection".)
- 2) Change the engine oil. (Refer to section "11. (1) Changing the Engine Oil".)
- 3) Drain the fuel from the fuel tank and strainer.
(Refer to section "11. (4) Cleaning/Replacing the Fuel Strainer" .)
- 4) Clean and inspect the spill containment.
(Refer to section "11. (8) Cleaning/Inspecting the Spill Containment" .)
- 5) Remove the starter key and store in a secure location.
- 6) Clean all parts and store the equipment in an area with low humidity and little dust with a cover or similar protection covering it.

<Note>

- Recharge a removed battery approximately once every month.

13. Troubleshooting

Warning: Electric Shock/Injury

- Do not touch the equipment during operation if the equipment or your body is wet.
- Always be sure to stop the engine and remove the starter key before performing any equipment check or maintenance.
- Do not operate the equipment with any doors or covers open. There is a danger of hair, body parts and other items being caught up in moving parts such as cooling fans and belts.

Warning: Fire

- Always be sure to stop the engine when inspecting fuel or refueling, and absolutely never perform such tasks near fire or other open flame. Wait until the engine has completely cooled before inspecting fuel or refueling.
- Always be sure to wipe up any spilled fuel or oil.
- Spilled fuel and oil accumulates in the spill containment. Do not operate the equipment with liquid accumulated in the spill containment.
- Absolutely never use the equipment if there is a fuel, oil or cooling water leak, and be sure to always repair the leak before using.
- Absolutely never inspect or perform maintenance to the equipment near fire or other open flame.

Warning: Injury to Eyes and Skin

- Use protective gear, such as rubber gloves, when inspecting or replacing the battery due to the dilute sulfuric acid in the battery fluid. Be sure that fluid does not get into eyes, or on skin or clothing.
- If battery fluid gets into the eyes, or on the skin or clothing, immediately wash with a large amount of water, and always be especially sure to seek medical attention if it gets into the eyes.

Warning: Explosion

- Do not operate the equipment or recharge the battery when the battery fluid level is below the lower level.
- Do not generate any sparks near the battery and do not allow any fire or other open flame near the equipment because the battery generates ignitable gas.

Caution: Burn

- The engine, muffler and similar parts are extremely hot during operation and immediately after stopping the equipment. Never touch hot parts.
- Never open the radiator cap during operation or immediately after stopping the equipment. Hot cooling water and steam will spurt out.
- Always be sure to stop the engine and allow it to cool before inspecting or changing the engine oil. Opening the oil gauge or oil plug during operation will result in hot oil spurting out.

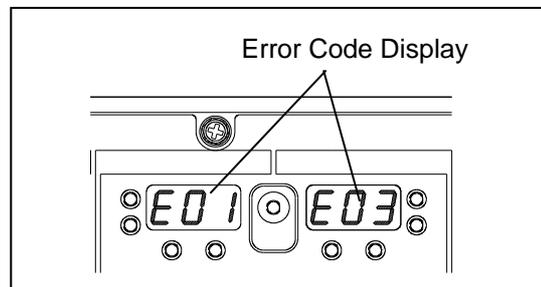
Refer to the table below to perform inspection when the equipment is operating poorly. If you cannot resolve a problem after inspecting the equipment, request repair at the retail outlet where the equipment was purchased.

Symptom	Possible Causes	Remedy
Starter motor does not start.	<ol style="list-style-type: none"> 1. Battery has a low charge. 2. Battery is deteriorated. 	<ol style="list-style-type: none"> 1. Recharge the battery. 2. Replace the battery.
Engine does not start.	<ol style="list-style-type: none"> 1. Fuel lever is "CLOSE" . 2. No fuel 3. Water or foreign material is mixed in with the fuel. 4. Blown fuse 	<ol style="list-style-type: none"> 1. Turn the fuel lever to "OPEN" . 2. Add fuel. 3. Drain water from and clean the fuel tank and fuel strainer. 4. Replace the fuse.
Engine starts but quickly stops.	<ol style="list-style-type: none"> 1. Insufficient oil 2. Overheating of water temperature 3. Battery recharging fault 	<ol style="list-style-type: none"> 1. Add oil. 2. Comply with rated outputs/Add cooling water. 3. Repair.
Black or white smoke is continuously exhausted from the muffler.	<ol style="list-style-type: none"> 1. Overloaded 	<ol style="list-style-type: none"> 1. Comply with the rated output.
Engine does not stop.	<ol style="list-style-type: none"> 1. Stop solenoid fault 	<ol style="list-style-type: none"> 1. Turn the fuel lever to "CLOSE" to stop the engine and repair.
Weak welding arc	<ol style="list-style-type: none"> 1. Single/Dual selector is set to "DUAL" . 2. Frequency selector is set to "50Hz" . 3. Wrong Output control dial position 4. Faulty cable connection 5. Improper cable (excessively thin) 6. Faulty connection with base material 7. Using simultaneously as AC power source 8. Welding cable short circuit 	<ol style="list-style-type: none"> 1. Set to "SINGLE" . 2. Set to "60Hz" . 3. Turn the dial clockwise 4. Connect securely. 5. Replace with cable according to "Welding Cable Selection" . 6. Connect securely. 7. Do not use as AC power source. 8. Remove the cause of the short circuit.
Strong welding arc	<ol style="list-style-type: none"> 1. Single/Dual selector is set to "SINGLE" . 2. Wrong Output control dial position 	<ol style="list-style-type: none"> 1. Set to "DUAL" . 2. Turn the dial counterclockwise
Weld output cannot be adjusted.	<ol style="list-style-type: none"> 1. Remote controller is connected. 	<ol style="list-style-type: none"> 1. Disconnect the remote controller. Or, adjust using the remote controller.
No AC power output	<ol style="list-style-type: none"> 1. Breaker is "OFF" . 	<ol style="list-style-type: none"> 1. Turn the breaker to "ON" .
AC power output is weak.	<ol style="list-style-type: none"> 1. Wrong frequency 2. The current of devices using the equipment exceed the rated current. 3. Using simultaneously for welding. 	<ol style="list-style-type: none"> 1. Check frequency 2. Refer to "Usable Device Capacities" . 3. Stop welding.

Symptom	Possible Causes	Remedy
Engine cannot obtain high speed.	<ol style="list-style-type: none"> 1. Idle control switch is set to "ECO" . 2. Current of device using the equipment as AC power source is 1 A or less. 	<ol style="list-style-type: none"> 1. Set to "AUTO" or "HIGH" . 2. Idle control switch is set to "HIGH" .
Engine cannot obtain low speed.	<ol style="list-style-type: none"> 1. Idle control switch is set to "HIGH". 2. Welding cable short circuit 	<ol style="list-style-type: none"> 1. Set to "ECO" or "AUTO" . 2. Remove the cause of the short circuit.
Weld output cannot be adjusted by remote controller	<ol style="list-style-type: none"> 1. Connect the AC power source into the remote controller connection. 	<ol style="list-style-type: none"> 1. Disconnect the AC power source
VRD does not work.	<ol style="list-style-type: none"> 1. VRD switch is set to "OFF" . 	<ol style="list-style-type: none"> 1. Set to "ON" .

■ Error Code Display

Error codes are displayed on the DC meters when the control board detects an error. If the error code is displayed, follow to the procedures in the "Remedy".



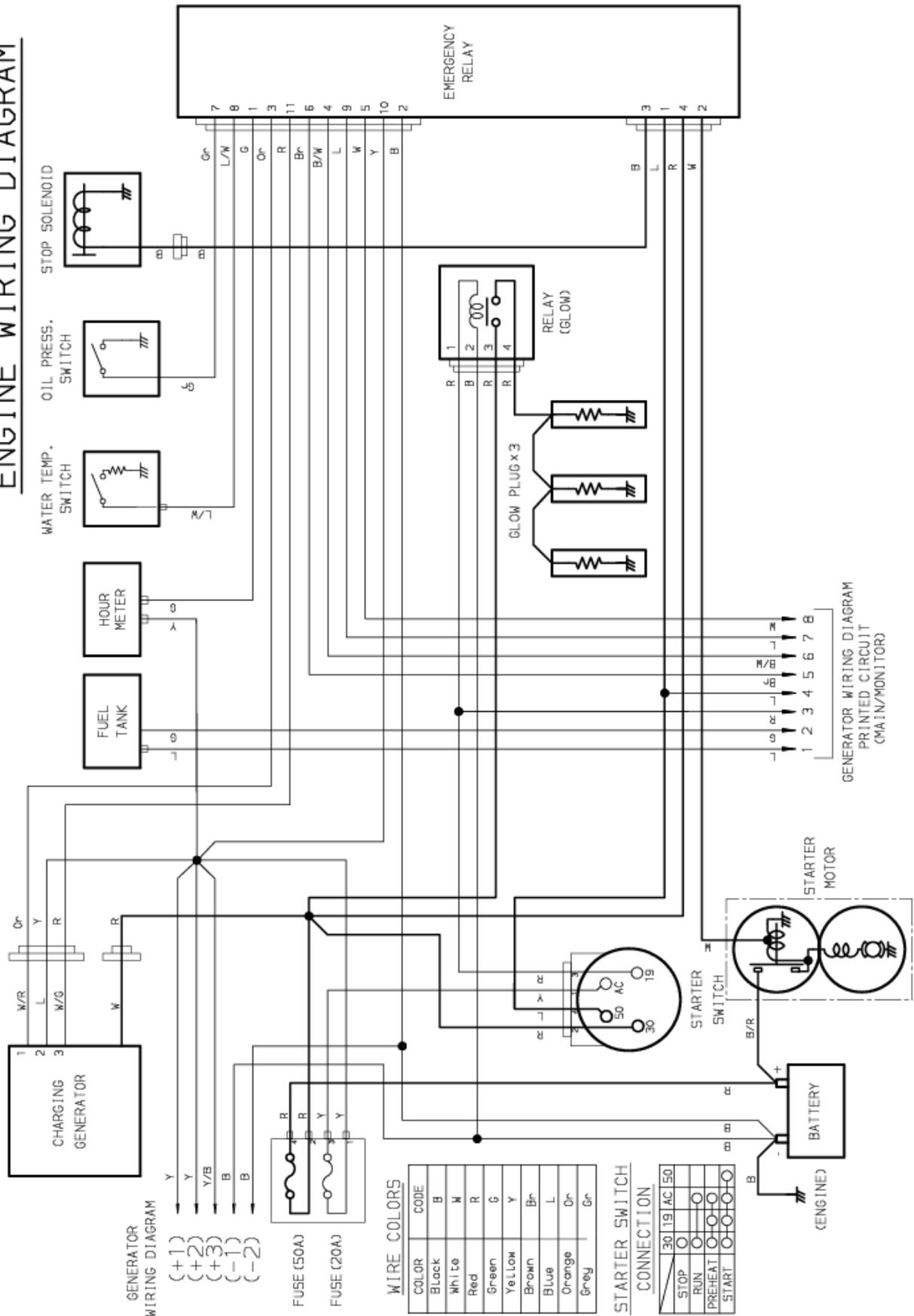
Error Code	Symptom	Remedy
“ E01 ”	Overheating of control parts for welding	<p>Set the idle control switch to "ECO" or "AUTO". Run the engine to cool it down at idle under no-load until the "E01" display disappears.</p> <p>* This error is automatically resolved when temperature of the control parts lowered to normal.</p>
“ E03 ”	Short circuit of weld output	<p>Stop the engine. Return the short circuit of the weld output and restart the engine.</p>

<Note>

- Maintenance of this equipment must be performed by specialized technicians.
- When performing maintenance with doors or covers open, be sure that no other persons can accidentally come close to the equipment. Close all doors and covers if momentarily leaving the equipment unattended.
- A simple inspection cannot always resolve some problems. If you cannot resolve a problem after inspecting the equipment, request repair at the retail outlet where the equipment was purchased.

14. Engine Wiring Diagram

ENGINE WIRING DIAGRAM



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